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THE

# DENTAL COSMOS:

A

## MONTHLY RECORD OF DENTAL SCIENCE.

*Devoted to the Interests of the Profession.*

EDITED BY

EDWARD C. KIRK D.D.S.

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Observe, Compare, Reflect, Record.

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VOL. XXXVII.

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THE

# DENTAL COSMOS.

VOL. XXXVII. PHILADELPHIA, JANUARY, 1895. NO. 1.

## ORIGINAL COMMUNICATIONS.

### EXAMINATION OF PRE-HISTORIC CRANIA.

FINAL REPORT BY JOHN J. R. PATRICK, CURATOR OF THE INVESTIGATION.

(Read before the American Dental Association, August 9, 1894.)

GENTLEMEN,—I have the honor to submit herewith the final report of the examination of human crania in the principal museums of the United States.

Allow me to quote from the previous report as follows: "The bound records are too cumbersome for publication in our Transactions, as some of the phenomena observed and provided for in the tables do not occur oftener than once in one thousand; yet provision had to be made for these on every page. Many valuable observations that could not be represented by symbols are recorded in the bound volumes under the head of 'Remarks,' provided for on each page of the records, and these remarks must find a fitting place and connection in the final record of the investigation in our Transactions.

"This condition of things necessitated the construction of additional tables to carry the observations made under the heads of remarks and the symbols on the diagrams of the original record.

"By this arrangement the necessity of using the diagrams in the records of our association will be obviated, and the use of one page for each examination will be dispensed with. The publication of tables in our Transactions from year to year would encumber the volumes with many folding plates, and make the record of the investigations disconnected, and therefore unsatisfactory for a work of reference. I therefore respectfully recommend that the publication of tables, catalogue, and record numbers of the crania in the several collections in our museums be dispensed with in our annual reports, and a separate volume be published as an appendix to our Transactions at the close of the investigation, a volume that will be a complete index to all the crania that have been examined."

That the work of examination has been conscientiously and well performed, the following names are sufficient guarantee:

For the Peabody Museum of Harvard University, Drs. R. R. Andrews, Jos. King Knight, and Mr. G. W. Newton (anatomist).

For the Army Medical Museum of Washington, D. C., Drs. H. B. Noble, Chas. B. Munson, O. D. Darrell.

For the Academy of Natural Sciences of Philadelphia, Drs. C. N. Peirce, J. E. Ives and brother.

For the Chicago Medical College, Drs. Louis Ottofy, John S. Marshall, L. L. Davis, J. O. Brown.

For the Davenport Academy of Science, Iowa, Drs. W. S. Hosford, Jos. R. Kulp, and R. S. Bandy.

For the Patrick Collection, now in the Museum of the Historical Society of St. Louis, Missouri, Drs. H. J. McKellops, A. H. Fuller, and J. W. Wick.

## ABSTRACT OF ALL THE VOLUMES RECORDING THE CONDITION OF THE TEETH AND JAWS OF HUMAN CRANIA IN THE FOLLOWING MUSEUMS ;

The Peabody Museum of Harvard University.

The Army Medical Museum, Washington, D. C.

The Collection of Dr. Samuel George Morton in the Academy of Natural Sciences, Philadelphia.

The Collection in the Davenport Academy of Science, Iowa.

The Collection in the Chicago Medical College, Illinois.

And a Collection obtained from an ancient burial mound near the great Cahokia Temple Mound in St. Clair County, Illinois, now in the Museum of the Missouri Historical Society in St. Louis.

## PACIFIC.

### Including Sandwich Islands, Australia, New Zealand, and Tchookabee.

### *Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 169 |
| Number of decayed teeth observed | 60 |
| Number of decayed teeth on the right side | 28 |
| Number of decayed teeth on the left side | 32 |
| Inclusion of teeth | 17 |
| Diminution in number of teeth | 57 |
| Teeth lost ante-mortem | 185 |
| Teeth lost ante-mortem on the right side | 91 |
| Teeth lost ante-mortem on the left side | 94 |
| Teeth lost post-mortem | 1093 |
| Malposition of teeth | 5 |
| Supplemental teeth | 2 |
| Multiple tubercles | 12 |
| Teeth rotated | 20 |
| Horizontality of teeth | 1 |
| Cysts the result of alveolar abscesses | 53 |
| Perforated antrums | 5 |
| Roots of teeth convergent | 3 |
| Roots of teeth divergent | 10 |
| Prognathous | 3 |
| Orthognathous | 31 |
| Isognathous | 12 |
| Enamel of teeth grooved | 2 |
| Enamel of teeth pitted | 4 |
| Enamel of teeth granular | 2 |
| Salivary calculi | 65 |

### *Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 111 |
| Number of decayed teeth observed | 58 |
| Number of decayed teeth on the right side | 26 |
| Number of decayed teeth on the left side | 32 |
| Inclusion of teeth | 13 |
| Diminution in number of teeth | 40 |
| Teeth lost ante-mortem | 114 |
| Teeth lost ante-mortem on the right side | 58 |
| Teeth lost ante-mortem on the left side | 56 |
| Teeth lost post-mortem | 522 |
| Malposition of teeth | 1 |
| Supplemental teeth | 1 |
| Multiple tubercles | 3 |
| Teeth rotated | 11 |
| Cysts the result of alveolar abscesses | 19 |
| Horizontality of teeth | 11 |
| Constriction of maxilla | 2 |
| Enamel of teeth pitted | 3 |
| Salivary calculi | 4 |

## CENTRAL AMERICANS.

### INCLUDING MEXICANS, GUATEMALIANS, AND NICARAGUANS.

### *Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 77 |
| Number of decayed teeth observed | 27 |
| Number of decayed teeth on the right side | 13 |
| Number of decayed teeth on the left side | 14 |
| Inclusion of teeth | 3 |
| Diminution in number of teeth | 18 |
| Teeth lost ante-mortem | 146 |
| Teeth lost ante-mortem on the right side | 80 |
| Teeth lost ante-mortem on the left side | 66 |
| Teeth lost post-mortem | 644 |
| Multiple tubercles | 1 |
| Aberrant teeth | 1 |
| Teeth rotated | 4 |
| Horizontality of teeth | 2 |
| Cysts the result of alveolar abscesses | 26 |
| Perforated antrums | 2 |
| Constricted maxilla | 1 |
| Roots of teeth divergent | 2 |
| Roots of teeth convergent | 2 |
| Prognathous | 1 |
| Orthognathous | 16 |
| Isognathous | 15 |
| Enamel of teeth grooved | 15 |
| Enamel of teeth pitted | 21 |
| Salivary calculi | 11 |

### *Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 39 |
| Number of decayed teeth observed | 17 |
| Number of decayed teeth on the right side | 7 |
| Number of decayed teeth on the left side | 10 |
| Inclusion of teeth | 11 |
| Diminution in the number of teeth | 2 |
| Teeth lost ante-mortem | 60 |
| Teeth lost ante-mortem on the right side | 33 |
| Teeth lost ante-mortem on the left side | 27 |

| | |
|---|---|
| Teeth lost post-mortem | 248 |
| Teeth rotated | 4 |
| Horizontality of teeth | 6 |
| Cysts the result of alveolar abscesses | 8 |
| Enamel of teeth pitted | 4 |

## SOUTH AMERICANS.

### Including Peruvians, Chilians, Tierra-del-Fuegians, and Guanches.

### *Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 683 |
| Number of decayed teeth observed | 314 |
| Number of decayed teeth on the right side | 154 |
| Number of decayed teeth on the left side | 160 |
| Inclusion of teeth | 114 |
| Diminution in the number of teeth | 146 |
| Teeth lost ante-mortem | 1727 |
| Teeth lost ante-mortem on the right side | 848 |
| Teeth lost ante-mortem on the left side | 879 |
| Teeth lost post-mortem | 5510 |
| Malposition of teeth | 18 |
| Malposition by transposition | 1 |
| Supplemental teeth | 14 |
| Multiple tubercles | 15 |
| Aberrant teeth | 2 |
| Teeth rotated | 33 |
| Horizontality of teeth | 21 |
| Cysts the result of alveolar abscesses | 467 |
| Perforated antrums | 39 |
| Roots of teeth convergent | 34 |
| Roots of teeth divergent | 46 |
| Prognathous | 14 |
| Orthognathous | 24 |
| Isognathous | 18 |
| Hypertrophied alveolar border | 1 |
| Enamel of teeth pitted | 48 |
| Enamel of teeth grooved | 28 |
| Enamel of teeth granular | 5 |
| Crescentic enamel | 15 |
| Salivary calculi | 100 |

### *Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 178 |
| Number of decayed teeth observed | 76 |
| Number of teeth decayed on the right side | 41 |
| Number of teeth decayed on the left side | 35 |
| Inclusion of teeth | 17 |
| Diminution in number of teeth | 22 |
| Teeth lost ante-mortem | 345 |
| Teeth lost ante-mortem on the right side | 164 |
| Teeth lost ante-mortem on the left side | 181 |
| Teeth lost post-mortem | 1248 |
| Malposition of teeth | 7 |
| Teeth rotated | 16 |
| Horizontality of teeth | 15 |
| Cysts the result of alveolar abscesses | 44 |
| Roots of teeth convergent | 7 |
| Roots of teeth divergent | 3 |
| Hypertrophy of alveolar border | 4 |
| Enamel of teeth grooved | 24 |
| Enamel of teeth pitted | 26 |

## NORTH AMERICANS.

INCLUDING ESQUIMAUX, ALASKA, CALIFORNIA, MICHIGAN, OHIO, MASSACHUSETTS, KENTUCKY, IOWA, ILLINOIS, TENNESSEE, MISSISSIPPI, ARKANSAS, FLORIDA, AND OTHER STATES.

### *Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 1399 |
| Number of decayed teeth observed | 692 |
| Number of teeth decayed on the right side | 347 |
| Number of teeth decayed on the left side | 345 |
| Inclusion of teeth | 115 |
| Diminution in number of teeth | 144 |
| Teeth lost ante-mortem | 2536 |
| Teeth lost ante-mortem on the right side | 1243 |
| Teeth lost ante-mortem on the left side | 1293 |
| Teeth lost post-mortem | 7538 |
| Malposition of teeth | 39 |
| Malposition by transposition | 2 |
| Supplemental teeth | 13 |
| Multiple tubercles | 64 |
| Aberrant teeth | 9 |
| Teeth rotated | 142 |
| Horizontality of teeth | 46 |
| Cysts the result of alveolar abscesses | 627 |
| Perforated antrums | 33 |
| Constriction of maxillæ | 2 |
| Roots of teeth convergent | 29 |
| Roots of teeth divergent | 332 |
| Prognathous | 34 |
| Orthognathous | 328 |
| Isognathous | 357 |
| Hypertrophied alveolar border | 229 |
| Enamel of teeth grooved | 377 |
| Enamel of teeth pitted | 461 |
| Enamel of teeth granular | 12 |
| Crescentic enamel | 25 |
| Salivary calculi | 792 |

### *Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 1099 |
| Number of decayed teeth observed | 702 |
| Number of teeth decayed on the right side | 337 |
| Number of teeth decayed on the left side | 365 |
| Inclusion of teeth | 83 |
| Diminution in number of teeth | 146 |
| Teeth lost ante-mortem | 1881 |
| Teeth lost ante-mortem on the right side | 953 |
| Teeth lost ante-mortem on the left side | 928 |
| Teeth lost post-mortem | 4580 |
| Malposition of teeth | 24 |
| Malposition by transposition | 1 |
| Supplemental teeth | 12 |
| Multiple tubercles | 21 |
| Aberrant teeth | 2 |
| Teeth rotated | 167 |
| Horizontality of teeth | 69 |
| Cysts the result of alveolar abscesses | 442 |
| Roots of teeth convergent | 37 |
| Roots of teeth divergent | 116 |
| Hypertrophied alveolar border | 133 |
| Enamel of teeth grooved | 260 |
| Crescentic enamel | 5 |
| Enamel of teeth pitted | 419 |
| Salivary calculi | 120 |

## EUROPEAN.

### Including German, French, English, Irish, Swedes, Greeks, Italian, Anglo-American, and a few Modern Soldiers.

*Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 220 |
| Number of decayed teeth observed | 138 |
| Number of decayed teeth on the right side | 65 |
| Number of decayed teeth on the left side | 73 |
| Inclusion of teeth | 29 |
| Diminution in number of teeth | 44 |
| Teeth lost ante-mortem | 763 |
| Teeth lost ante-mortem on the right side | 385 |
| Teeth lost ante-mortem on the left side | 378 |
| Teeth lost post-mortem | 1308 |
| Malposition of teeth | 5 |
| Supplemental teeth | 1 |
| Multiple tubercles | 8 |
| Teeth rotated | 32 |
| Horizontality of teeth | 2 |
| Cysts the result of alveolar abscesses | 120 |
| Perforated antrums | 2 |
| Roots of teeth convergent | 2 |
| Roots of teeth divergent | 8 |
| Prognathous | 10 |
| Orthognathous | 41 |
| Isognathous | 37 |
| Hypertrophy of alveolar border | 8 |
| Crescentic enamel | 11 |
| Enamel of teeth pitted | 13 |
| Salivary calculi | 52 |

*Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 145 |
| Number of decayed teeth observed | 103 |
| Number of decayed teeth on the right side | 54 |
| Number of decayed teeth on the left side | 49 |
| Inclusion of teeth | 10 |
| Diminution in number of teeth | 45 |
| Teeth lost ante-mortem | 369 |
| Teeth lost ante-mortem on the right side | 180 |
| Teeth lost ante-mortem on the left side | 189 |
| Teeth lost post-mortem | 982 |
| Malposition of teeth | 7 |
| Multiple tubercles | 1 |
| Aberrant teeth | 1 |
| Teeth rotated | 74 |
| Horizontality of teeth | 23 |
| Cysts the result of alveolar abscesses | 51 |
| Enamel of teeth grooved | 2 |
| Enamel of teeth pitted | 2 |
| Crescentic enamel | 7 |
| Salivary calculi | 6 |

## Egyptian and African.

*Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 229 |
| Number of decayed teeth observed | 74 |
| Number of decayed teeth on the right side | 39 |
| Number of decayed teeth on the left side | 35 |
| Inclusion of teeth | 68 |

| | |
|---|---|
| Diminution in number of teeth | 43 |
| Teeth lost ante-mortem | 436 |
| Teeth lost ante-mortem on the right side | 215 |
| Teeth lost ante-mortem on the left side | 221 |
| Teeth lost post-mortem | 1416 |
| Malposition of teeth | 3 |
| Malposition by transposition | 1 |
| Supplemental teeth | 2 |
| Multiple tubercles | 7 |
| Teeth rotated | 1 |
| Horizontality of teeth | 11 |
| Cysts the result of alveolar abscesses | 63 |
| Perforated antrums | 1 |
| Constriction of maxillæ | 1 |
| Prognathous | 18 |
| Orthognathous | 44 |
| Isognathous | 14 |
| Hypertrophy of alveolar border | 3 |
| Enamel of teeth grooved | 10 |
| Crescentic enamel | 10 |
| Enamel of teeth pitted | 19 |
| Salivary calculi | 61 |

### *Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 94 |
| Number of decayed teeth observed | 39 |
| Number of decayed teeth on the right side | 18 |
| Number of decayed teeth on the left side | 21 |
| Inclusion of teeth | 15 |
| Diminution in number of teeth | 8 |
| Teeth lost ante-mortem | 140 |
| Teeth lost ante-mortem on the right side | 80 |
| Teeth lost ante-mortem on the left side | 60 |
| Teeth lost post-mortem | 312 |
| Malposition of teeth | 1 |
| Multiple tubercles | 4 |
| Teeth rotated | 2 |
| Horizontality of teeth | 2 |
| Cysts the result of alveolar abscesses | 13 |
| Roots of teeth divergent | 4 |
| Enamel of teeth grooved | 11 |
| Enamel of teeth pitted | 12 |
| Crescentic enamel | 6 |

## ASIATICS.

Including Malays, Chinese, Japanese, Armenians, Hindoos, and Burmese.

### *Superior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 124 |
| Number of decayed teeth observed | 22 |
| Number of decayed teeth on the right side | 13 |
| Number of decayed teeth on the left side | 9 |
| Inclusion of teeth | 31 |
| Diminution in number of teeth | 18 |
| Teeth lost ante-mortem | 211 |
| Teeth lost ante-mortem on the right side | 108 |
| Teeth lost ante-mortem on the left side | 103 |
| Teeth lost post-mortem | 651 |
| Malposition of teeth | 7 |
| Multiple tubercles | 5 |
| Aberrant teeth | 2 |
| Teeth rotated | 5 |

| | |
|---|---|
| Horizontality of teeth | 4 |
| Cysts the result of alveolar abscesses | 21 |
| Roots of teeth convergent | 3 |
| Roots of teeth divergent | 10 |
| Prognathous | 14 |
| Orthognathous | 35 |
| Isognathous | 11 |
| Hypertrophy of alveolar border | 2 |
| Enamel of tooth grooved | 1 |
| Crescentic enamel | 33 |
| Enamel of teeth pitted | 3 |
| Enamel of teeth granular | 1 |
| Salivary calculi | 77 |

### *Inferior Maxillæ.*

| | |
|---|---|
| Number of maxillæ examined | 80 |
| Number of decayed teeth observed | 23 |
| Number of decayed teeth on the right side | 13 |
| Number of decayed teeth on the left side | 10 |
| Inclusion of teeth | 7 |
| Diminution of teeth | 19 |
| Teeth lost ante-mortem | 80 |
| Teeth lost ante-mortem on the right side | 43 |
| Teeth lost ante-mortem on the left side | 37 |
| Teeth lost post-mortem | 358 |
| Malposition of teeth | 23 |
| Multiple tubercles | 1 |
| Teeth rotated | 8 |
| Horizontality of teeth | 2 |
| Cysts the result of alveolar abscesses | 3 |
| Constriction of maxilla | 1 |
| Crescentic enamel | 5 |

## TOTAL NUMBER OF UPPER AND LOWER TEETH EXAMINED, AND THE PERCENTAGE OF DISEASE IN EACH.

### South Americans.

| | |
|---|---|
| Total number of teeth examined | 6719 |
| Total number of teeth diseased | 2462 |
| Total percentage of diseased teeth | 36⅗ |

### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 5158 |
| Number of teeth diseased | 2041 |
| Percentage of diseased teeth | 39¼ |

### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 1561 |
| Number of teeth diseased | 421 |
| Percentage of diseased teeth | 27 |

### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 1002 |
| Number of upper left teeth diseased | 1039 |
| Excess in percentage of the left over the right | 3½ |
| Number of lower right teeth diseased | 222 |
| Number of lower left teeth diseased | 199 |
| Excess in percentage of the right over the left | 11½ |

### Central Americans.

| | |
|---|---|
| Total number of teeth examined | 930 |
| Total number of teeth diseased | 250 |
| Total percentage of diseased teeth | 26⅘ |

### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 567 |
| Number of teeth diseased | 173 |
| Percentage of teeth diseased | 30½ |

### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 363 |
| Number of teeth diseased | 77 |
| Percentage of diseased teeth | 21⅖ |

### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 93 |
| Number of upper left teeth diseased | 80 |
| Excess in percentage of the right over the left | 16¼ |
| Number of lower right teeth diseased | 40 |
| Number of lower left teeth diseased | 37 |
| Excess in percentage of the right over the left | 8 |

### NORTH AMERICANS.

| | |
|---|---|
| Total number of teeth examined | 27,362 |
| Total number of teeth diseased | 5811 |
| Total percentage of diseased teeth | 21⅕ |

### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 14,587 |
| Number of teeth diseased | 3228 |
| Percentage of teeth diseased | 22 |

### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 12,775 |
| Number of teeth diseased | 2583 |
| Percentage of teeth diseased | 20⅕ |

### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 1590 |
| Number of upper left teeth diseased | 1638 |
| Excess in percentage of the left over the right | .03 |
| Number of lower right teeth diseased | 1290 |
| Number of lower left teeth diseased | 1293 |
| Excess in percentage of the left over the right | .002⅓ |

### EUROPEAN.

| | |
|---|---|
| Total number of teeth examined | 3422 |
| Total number of teeth diseased | 1373 |
| Total percentage of diseased teeth | 40⅖ |

### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 2139 |
| Number of teeth diseased | 901 |
| Percentage of teeth diseased | 42⅕ |

### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 2183 |
| Number of teeth diseased | 402 |
| Percentage of diseased teeth | 18½ |

#### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 450 |
| Number of upper left teeth diseased | 451 |
| Excess in percentage of the left over the right | .0022 |
| Number of lower right teeth diseased | 234 |
| Number of lower left teeth diseased | 238 |
| Excess in percentage of the left over the right | .017 |

### Pacific and Sandwich Islanders.

| | |
|---|---|
| Total number of teeth examined | 2738 |
| Total number of teeth diseased | 417 |
| Total percentage of teeth diseased | 15¼ |

#### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 1537 |
| Number of teeth diseased | 245 |
| Percentage of diseased teeth | 16 |

#### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 1201 |
| Number of teeth diseased | 172 |
| Percentage of diseased teeth | 14⅓ |

#### Total Number of Diseased Teeth on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 119 |
| Number of upper left teeth diseased | 126 |
| Excess in percentage of the left over the right | 5½ |
| Number of lower right teeth diseased | 84 |
| Number of lower left teeth diseased | 88 |
| Excess in percentage of the left over the right | .045¼ |

### Egyptian.

| | |
|---|---|
| Total number of teeth examined | 3306 |
| Total number of teeth diseased | 689 |
| Total percentage of diseased teeth | 20⅘ |

#### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 2137 |
| Number of teeth diseased | 510 |
| Percentage of teeth diseased | 23⅘ |

#### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 1169 |
| Number of teeth diseased | 179 |
| Percentage of teeth diseased | 15⅓ |

#### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 254 |
| Number of upper left teeth diseased | 256 |
| Excess in percentage of the left over the right | .008 |
| Number of lower right teeth diseased | 98 |
| Number of lower left teeth diseased | 81 |
| Excess in percentage of the right over the left | .21 |

### Asiatics.

| | |
|---|---|
| Total number of teeth examined | 2180 |
| Total number of teeth diseased | 336 |
| Total percentage of diseased teeth | 15⅖ |

### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 1284 |
| Number of teeth diseased | 233 |
| Percentage of diseased teeth | 18 |

### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 896 |
| Number of teeth diseased | 103 |
| Percentage of diseased teeth | 11$\frac{1}{2}$ |

### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 121 |
| Number of upper left teeth diseased | 112 |
| Excess in percentage of the right over the left | .008 |
| Number of lower right teeth diseased | 56 |
| Number of lower left teeth diseased | 47 |
| Excess in percentage of the right over the left | .19 |

## GRAND TOTAL.

| | |
|---|---|
| Total number of teeth examined | 46,017 |
| Total number of teeth diseased | 11,338 |
| Total percentage of diseased teeth | 24$\frac{3}{5}$ |

### Total Number of Upper Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 28,369 |
| Number of teeth diseased | 7331 |
| Percentage of teeth diseased | 25$\frac{4}{5}$ |

### Total Number of Lower Teeth Examined.

| | |
|---|---|
| Number of teeth examined | 17,648 |
| Number of teeth diseased | 4007 |
| Percentage of diseased teeth | 22$\frac{4}{5}$ |

### Total Number of Teeth Diseased on the Right and on the Left.

| | |
|---|---|
| Number of upper right teeth diseased | 3662 |
| Number of upper left teeth diseased | 3669 |
| Excess in percentage of the left over the right | .002 |
| Number of lower right teeth diseased | 2024 |
| Number of lower left teeth diseased | 1983 |
| Excess in percentage of the right over the left | .0207 |

## AVERAGES OF MEASUREMENTS FOR WIDTH OF ARCH AND DEPTH OF PALATE.*

The measurements for width of arch and depth of palate have been confined to the collection of human crania contained in the Peabody

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* The measurements are made in inches, afterward converted into millimeters, sometimes by the examiner, but mostly by myself, especially in the later examinations. I have used no fractions of millimeters, hence these are mostly approximations, while the measurements in inches are supposed to be correct or nearly so; at least to $\frac{1}{64}$ of an inch in the first and to $\frac{1}{32}$ of an inch in the later examinations.

| | | |
|---|---|---|
| 25 millimeters | 1 | inch. |
| 35 " | 1.4 | inches. |
| 36 " | 1.44 | " |
| 37 " | 1.48 | " |
| 38 " | 1.52 | " |

So that a measurement between 1.4 and 1.44 inches would be 35 or 36 millimeters. A measurement between 1.48 and 1.52 inches would be 37 or 38 millimeters, as the inches are nearer 1.48 or 1.52.

Museum at Harvard University, with the exception of forty-two obtained from a burial mound near the great Cahokia Temple Mound in St. Clair County, Illinois, and now forming a part of the Patrick Collection of Indian relics in the museum of the Missouri Historical Society in St. Louis, Mo.

Total measured for width of arch, 578. Total measured for depth of palate, 490.

The average width of arch in these 578 is 36 millimeters, or 1.4217 inches. The average depth of palate in 490 crania is 25 millimeters, or 1.0019 inches.

These totals are grouped by races and nationalities as follows :

| | Millimeters. | Inches. |
|---|---|---|
| **North American Indians.** | | |
| Width of arch, 340 measured | 37 | 1.4775 |
| Depth of palate, 269 measured | 28 | 1.0658 |
| **Ohio Mound Builders.** | | |
| Width of arch, 6 measured | 38 | 1.5322 |
| Depth of palate, 4 measured | 28 | 1.1406 |
| **Pahute Indian (Utah).** | | |
| Width of arch, 1 measured | 37 | 1.5 |
| Depth of palate, 1 measured | 27 | 1.0625 |
| **Pacific Coast Indians.** | | |
| Width of arch, 5 measured | 38 | 1.55 |
| Depth of palate, 5 measured | 27 | 1.11 |
| **Sandwich Islanders (Hawaiian).** | | |
| Width of arch, 63 measured | 37 | 1.4712 |
| Depth of palate, 58 measured | 27 | 1.0528 |
| **Unknown.** | | |
| Width of arch, 6 measured | 37 | 1.479 |
| Depth of palate, 5 measured | 27 | 1.0625 |
| **French (Parisian).** | | |
| Width of arch, 12 measured | 36 | 1.448 |
| Depth of palate, 11 measured | 28 | 1.1477 |
| **Aleutian (Behring Sea).** | | |
| Width of arch, 2 measured | 39 | 1.5625 |
| Depth of palate, 2 measured | 29 | 1.1875 |
| **Southern Europe (mostly Italian).** | | |
| Width of arch, 71 measured | 36 | 1.4428 |
| Depth of palate, 67 measured | 28 | 1.153 |
| **Mexicans.** | | |
| Width of arch, 12 measured | 32 | 1.2864 |
| Depth of palate, 8 measured | 27 | 1.0937 |
| **Africans.** | | |
| Width of arch, 18 measured | 36 | 1.432 |
| Depth of palate, 18 measured | 27 | 1.063 |

AMERICAN INDIANS, FROM CAHOKIA MOUND, ILLINOIS.

| | MILLIMETERS. | INCHES. |
|---|---|---|
| Width of arch, 42 measured | 39 | 1.5595 |
| Depth of palate, 42 measured | 15 | 0.5921 |

In the above are included 26 children's skulls measured in width of arch, and 21 for depth of palate.

| | | |
|---|---|---|
| Width of arch, 26 measured | 36 | 1.4278 |
| Depth of palate, 21 measured | 21 | .8305 |

ITALIAN.

| | | |
|---|---|---|
| Width of arch, 3 measured | 31 | 1.25 |
| Depth of palate, 3 measured | 18 | .73 |

TENNESSEE INDIANS.

| | | |
|---|---|---|
| Width of arch, 9 measured | 36 | 1.437 |
| Depth of palate, 7 measured | 22 | .89 |

MEXICAN.

| | | |
|---|---|---|
| Width of arch, 1 measured | 32 | 1.375 |
| Depth of palate, 1 measured | 19 | .75 |

HINDOO.

| | | |
|---|---|---|
| Width of arch, 1 measured | 23 | .9375 |

CALIFORNIAN.

| | | |
|---|---|---|
| Width of arch, 1 measured | 36 | 1.4375 |
| Depth of palate, 1 measured | 2 | .0625 |

SANDWICH ISLANDERS.

| | | |
|---|---|---|
| Width of arch, 2 measured | 34 | 1.375 |
| Depth of palate, 2 measured | 25 | 1. |

MISCELLANEOUS AMERICANS.

| | | |
|---|---|---|
| Width of arch, 5 measured | 34 | 1.375 |
| Depth of palate, 4 measured | 25 | .9687 |

KENTUCKIANS.

| | | |
|---|---|---|
| Width of arch, 2 measured | 35 | 1.4062 |

Subtracting these children and their measurements from the above totals of children and adults together, 578 and 490, we have for this report a total of adults 552, measuring in width of arch, in average 37 millimeters, or 1.421 inches, and of 469 averaging in depth of palate 25 millimeters, or 1.0092 inches, instead of 1.4217 and 1.0019 inches as in first totals of adults and children averaged together. My first report contains the two dimensions (width of arch and depth of palate) averaged for adults numbering 569 and 507 ; adding these to the total of adults reported herein, 552 and 469, we have an aggregate contained in the two reports of 1121 adults, averaging in width of arch 32 millimeters, or 1.2901 inches, and of 976 adults in both reports, averaging in depth of palate 26 millimeters, or 1.0259 inches.

The five children in first report averaged separately as Peruvians, Mexicans, and a Californian, present for all five an average for width of arch of 32 millimeters, or 1.307 inches, and for depth of palate 25 millimeters, or .994 inch.

One of the 26 children in this report, a Tennesseean, shows an abnormal width of arch, 1⅝ inches, or 41 millimeters. Subtracting this from the total and averaging the remaining 25 we have for this remainder, instead of 1.4278 inches, or 36 millimeters as above, for width of arch, an average of 35 millimeters, or 1.4192 inches.

The depth of palate is normal, one inch, and about the average depth in children. The average width of arch in adults and that in children show very little difference.

## NOTES ON ANOMALIES—PEABODY MUSEUM.

Vol. I, pages 8, 17, 29. There are ten cases of crescentic enamel.

Vol. I, page 14. Confusion of the left superior second bicuspid, and first molar.

Vol. II, page 14. Diastema in region of the superior cuspids and bicuspids.

Vol. II, page 16. Diminution of superior right and left third molars and the central incisors.

Vol. II, page 41. Diastema in region of superior right and left cuspids.

Vol. II, page 60. Diastema in region of inferior cuspids and bicuspids.

Vol. III, page 32. A remarkably formed superior maxilla, the tuberosities of the process approximating, the arch forming almost three-fourths of a circle.

Vol. III, page 28. Malposition by transposition. The right superior cuspid is between the first and second bicuspids in line, and the left cuspid is crowded out of place by a supplemental tooth.

Vol. III, page 66. The right cuspid is included in the palate, the crown directed inward and forward behind the lateral incisor.

Vol. III, page 96. Deciduous teeth of a child, decayed.

Vol. IV, page 55. The right cuspid is included, its crown directed to the posterior as far back as the second bicuspid; the third right molar is also included, its crown directed to the posterior, and the crown of the left third molar is directed to the posterior, but not included.

Vol. IV, page 65. Nanism. The right cuspid is very small, much smaller than the left.

Vol. IV, page 83. Two supplemental teeth, the left one in alignment and the right one included below the central and lateral incisors; they have caused the teeth to move from the left to the right side, producing asymmetry of the arch, the left first molar being opposite the right second bicuspid.

Vol. IV, page 94. One left supplemental lateral incisor.

Vol. V, page 6. A very small skull, supposed to be a dwarf. The measurements of the arch are not proportionately small. Width of palate 37 millimeters, depth of palate 21 millimeters.

Vol. V, page 55. Diastema between superior left cuspid and lateral incisor.

Vol. V, page 79. Diminution of the four superior incisors, and the third right molar included beneath the second molar.

Vol. V, page 77. The left superior cuspid is horizontal; its crown is directed to the posterior, and rests directly above the first molar beneath the projection of the malar process.

Vol. V, page 81. Geantism. The first superior molars are very large, the crown of one being 12 millimeters square.

Vol. V, page 94. The right superior cuspid is directed forward, the crown appearing above the central incisor at the nasal process.

Vol. VI, page 11. Inferior right cuspid and bicuspid are horizontal, their crowns directed toward the median line, and are imbricated.

Vol. VI, page 19. The lower incisors imbricated.

Vol. VI, page 52. The two upper and the two lower central incisors never present.

Vol. VI, page 95. The remains of deciduous teeth present.

Vol. VII, page 14. An enamel nodule on the cervical borders of the right third superior molar.

Vol. VII, page 18. Enamel nodules on the cervical borders of the superior third molars.

Vol. VII, page 31. Enamel nodule on the cervical border of the right first bicuspid.

Vol. VII, page 48. The left superior central incisor has doubled up upon itself, the crown directed upward, presenting its posterior surface to the anterior, its crown coming out between the nasal and the alveolar process.

Vol. VII, page 50. The superior maxilla has ten cysts, the inferior five, the result of alveolar abscesses; the teeth all present with the exception of four; they are badly worn and necrosed. It will be observed that the percentage of decayed teeth in the California Indians is much less than in the Peruvians, but the ravages of alveolar abscesses leaving cysts in the process are greater in the Californians. The difference in the character of the diseased teeth in the two races is easily accounted for if we consider their environment; the Californian being confined to the sea-coast, large quantities of siliceous material were ever present in his food, which produced the worn condition of his teeth, the destruction of their pulps, and final necrosis.

Vol. VII, page 53. The two deciduous inferior right lateral and central incisors fused together.

Vol. VII, page 70. One deciduous molar present in adult, much worn, and no sign of its successor.

Vol VIII, page 17. Diastema on the left side between the inferior bicuspids.

Vol. VIII, page 9. The inferior left deciduous molar present, and no indications of its successor (adult).

Vol VIII, page 36. The upper and lower teeth in good condition, and all present with but one decayed in the lower.

Vol. IX, page 3. Caries on external cervical border of third molars.

Vol. IX, page 9. This cranium has an unusually fine set of teeth.

Vol. IX, page 18. The jaw is nodular on the right side.

Vol. IX, page 20. Shows caries on external cervical border of left cuspid.

Vol. IX, page 22. A fine set of teeth.

Vol. IX, page 24. A confusion of inferior right lateral incisor with the cuspid.

Vol. IX, page 31. A rather strange case. A large cavity in the jaw, including process of right superior first and second molars. In the bottom of the cavity is a small molar; its roots go so nearly through the jaw that a little nodule on the under and inner side indicates its position.

Vol. IX, page 51. There is an imbrication of three succedaneous teeth.

Vol. IX, page 60. The third superior right molar has four roots.

Vol. IX, page 69. Upper jaw is nodular on the outer wall of process.

Vol. IX, page 71. The inferior right bicuspids have imbedded their crowns into each other, but are not confused.

Vol. X, page 29. Hypertrophy of alveolar border on both sides, and more or less nodular.

Vol. X, page 37. Imbrication of one succedaneous tooth.

Vol. X, page 43. Diastema between superior right incisor and lateral.

Vol. X, page 66. Two supernumerary teeth included inside the arch, and one outside not included, on the opposite side.

Vol. X, page 79. One supernumerary tooth included.

Vol. X, page 94. One supernumerary tooth included inside the arch.

Vol. XI, page 1. No indications that permanent incisors have ever been present.

Vol. XI, page 13. Supernumerary tooth between right cuspid and bicuspid decayed.

Vol. XI, page 14. Border of process from left cuspid to third molar more or less nodular.

Vol. XI, page 23. A perfect set of teeth, upper and lower.

Vol. XI, page 38. Supernumerary tooth between right lateral incisor and cuspid; crown of first bicuspid is out of alignment.

Vol. XI, page 43. At the site of the right and left bicuspids the temporary molars are still present and no indications of bicuspids, although the rest of the teeth are fully developed.

Vol. XI, page 95. The floor of the nose cavities, the upper part being broken, shows the presence of two teeth lying nearly horizontal.

Vol. XI, page 98. The left bicuspids stand side by side, and each revolved nearly ninety degrees on its axis.

Vol. XII, page 17. Left third molar has a large enamel nodule on the inner root.

Vol. XII, page 28. Each of the third molars of the lower jaw are multicuspid. (Geantism.)

Vol. XII, page 51. One diastema on the right and one on the left, between the two bicuspids.

Vol. XII, page 66. Has a diastema between the right bicuspids.

Vol. XII, page 78. The right upper bicuspids are arranged nearly side by side, and each has rotated ninety degrees. The second bicuspid stands on the inner side.

Vol. XIII, page 5. Inferior right third molar has a small enamel nodule on external cervical border.

Vol. XIII, page 9. Diastema between left lateral incisor and cuspid.

Vol. XIII, page 13. A very large cavity at right superior molar, which extends ⅝ inch long through the jaw from side to side, and is ⅝ inch in depth.

Vol. XIII, page 27. Superior left first bicuspid small; the process is not more than half as large and deep as second bicuspid. The supernumerary tooth just inside of process of first bicuspid is an aberrant dwarf.

Vol. XIII, page 28. The supernumerary tooth is an aberrant dwarf, and has a round crown.

Vol. XIII, page 37. Imbrication of one succedaneous tooth.

Vol. XIII, page 76. The supernumerary tooth between the left bicuspids is an aberrant dwarf, and the one between the right bicuspids is the same.

Vol. XIV, page 58. Inferior left bicuspid rotated, apparently not due to crowding.

Vol. XIV, page 81. The process at the site of right second bicuspid is small and shallow, indicating that a deciduous tooth had remained. There are three more processes between the site of the deciduous tooth and the first molar, but the next process shows a double root, thus indicating the position of the first bicuspid; following this there are two more regular processes before the first molar. Thus the indications are a dwarf cuspid (Nanism), and a supernumerary tooth between the first bicuspid and first molar.

Vol. XIV, page 82. No indications of third molars.

Vol. XV, page 48. Both third molars are horizontal; the right molar seems to have started to grow up perpendicular and then bent over at right angles, the crown pointing inward. All remaining teeth are very badly worn.

Vol. XV, page 80. The necks of superior lateral incisors have been worn into or eroded, a groove is nearly half-way through on the right lateral, and is deepest on the outside. The inside of the left central is in like condition.

Vol. XV, page 68. Has a diastema between the right bicuspids.

Vol. XV, page 70. Large cyst the remains of abscess including the third molars on the left side, extending five-eighths of an inch into the jaw.

Vol. XV, page 87. On the interior of each side opposite the bicuspids is a large nodule about one-half inch in diameter.

Vol. XVI, page 1. A supplemental tooth between lateral and central incisors has not erupted.

Vol. XVI, page 23. Lower jaw extends beyond upper.

Vol. XVI, page 27. A beautiful set of teeth.

Vol. XVI, page 31. A supernumerary tooth is behind the inner root of right upper third molar, and has been exposed by a slight break in the jaw.

Vol. XVI, page 33. Diminution of the right and left first bicuspids.

Vol. XVI, page 36. A dwarf. Skull is very small, having a capacity of only 400 cubic centimeters. Some of the large skulls handled have been marked as high as 1400 to 1500 cubic centimeters. Arch of upper jaw compares favorably in size with an ordinary jaw. The teeth are average in size. Lower jaw considerably shorter than the upper.

Vol. XVI, page 37. Hypertrophy of alveolar border on both sides in the region of the six molars.

Vol. XVI, page 39. Both superior first molars are inclined inward. Crowns nearly worn off on some of the teeth.

Vol. XVI, page 45. Temporary molars (right superior) have been lost postmortem. The left temporary molar present, and no sign of the bicuspids.

The upper right third molar not fully developed, and there are no indications of third molars in lower jaw.

Vol. XVI, page 58. Diminution of inferior left lateral incisor.

Vol. XVI, page 60. Superior left second bicuspid rotated and not crowded.

Vol. XVI, page 66. Diminution of superior right second bicuspid.

Vol XVI, page 81. Diastema between right cuspid and bicuspid, and between left lateral incisor and cuspid.

Vol. XVI, page 86. Two diminutions ; one being the right lateral incisor, the other the right second bicuspid.

Vol. XVII, page 38. Both superior third molars inclined inward.

Vol. XVII, page 44. Superior right second bicuspid rotated.

Vol. XVII, page 46. Right lateral and both central incisors have grooves on the outer surface of crown about one-eighth of an inch from cutting-edge ; in the right central the groove extends about half-way through the tooth and looks as though it had been filed.

Vol. XVII, page 70. Diminution of right and left superior first bicuspids.

Vol. XVII, page 76. Diastema between superior right cuspid and first bicuspid.

Vol. XVII, page 88. Diastema between superior left first and second bicuspids.

Vol. XVII, page 89. Superior right second molar is a case of Geantism.

Vol. XVIII, page 4. Superior third molar is a dwarf, half natural size. (Nanism.)

Vol. XVIII, page 21. The corner of the crown of the included superior right third molar is under the posterior root of second molar.

Vol. XVIII, page 30. The superior third molars have small enamel tubercles on the cervical borders.

Vol. XVIII, page 42. From the appearance of the process, the left cuspid must have been imbedded obliquely across the process of the lateral incisor.

Vol. XVIII, page 44. The corner of the crown of the lower right third molar (which is included and horizontal) has been exposed by the absorption of the jaw in that region.

Vol. XVIII, page 68. Crown of superior left lateral incisor is crowded inward.

Vol. XVIII, page 70. An unusually perfect set of teeth.

Vol. XVIII, page 71. Both inferior third molars are inclined inward about forty-five degrees, and the superior left central and lateral incisors are rotated and imbricated.

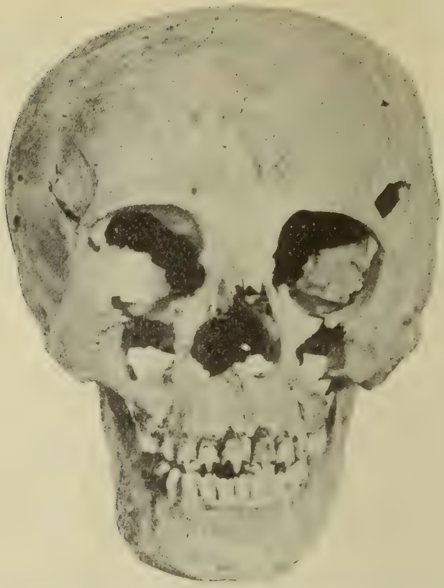
NOTE.—There is a suture down the middle of the frontal bone in about ten per cent. of the Italians. In other groups examined the open suture is a rare thing.

Since the work at the Peabody Museum was completed, and the volumes of record returned to me, I have received, through the kindness of Dr. Andrews, photographs and descriptive text of a very remarkable pre-historic skull and a number of teeth from Central America.

The skull and teeth were brought to Cambridge by the Hemenway Expedition, which was sent by Harvard University to Central America in 1891. Fig. 1 is a photograph of the skull found at Labora, which shows the teeth filed in a peculiar manner.

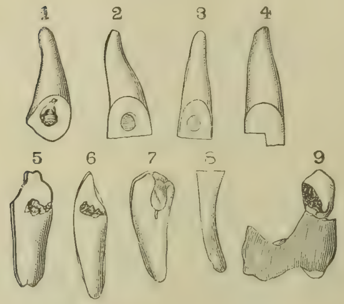
The third molars and the left cuspid were just erupting during the life of the subject, which would indicate its age ; the left cuspid is out of alignment within the arch about a quarter of an inch, and is not seen in the plate ; the teeth are free from decay. The same expedition found at Copan, Honduras, a number of very ancient graves, which contained mere fragments of human skeletons, and these fragments were very friable. Many of the teeth were recognized by the enamel only. In a few cases the teeth were ornamented with inlays of green jade on their front surfaces and beautifully polished ; others filed in a peculiar manner, and some decayed. A most inter-

FIG. 1.



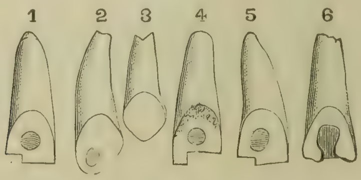
Pre-historic Skull found at Labora, Central America.

FIG. 2.



1, 2, inlay lost (probably lost), filled with a red cement. 3, beautiful green jade inlay. 4, filed; no inlay. 5, 6, 7, 9, decayed. 8, stone tooth, left lower incisor.

FIG. 3.



1, inlay missing; filed. 2, inlay near cutting-edge. 4, 5, inlaid with jade; filed. 6, inlay missing; broken through to cutting-edge.

esting find was a left lower incisor carved from a dark stone which had been implanted in the place of one which had been lost; the tartar upon the stone substitute is evidence that it had been worn during life. (See Figs. 2 and 3.)

## DAVENPORT ACADEMY OF SCIENCE, IOWA.

Vol. I, page 2. Teeth are abraded down to pulp-chamber in cuspids and bicuspids; the canals are closed up by secondary dentine.

Vol. I, page 3. Abrasion of all teeth present, and pulp-chambers exposed.

Vol. I, page 4. Grinding-surfaces of all the teeth worn down one-third of the crowns.

Vol. I, page 5. Pulp exposed in second and third left inferior molars; and the process very thin on buccal and labial surfaces.

Vol. I, page 8. The roots of the left cuspid and first bicuspid are fused together. The palate bones show a cleft on the left side.

Vol. I, page 10. Process gone in region of first right and second left molars on buccal surfaces, consequent upon the accumulation of tartar.

Vol. I, page 18. Enamel deeply cupped on anterior teeth.

Vol. I, page 22. Right first molar decayed at cervical margin.

Vol. I, page 24. Very deep fissures in molars (coronal surface).

Vol. I, page 47. Cleft palate.

Vol. I, page 49. Phagedenic pericementitis on the six anterior teeth.

Vol. I, page 52. Lower jaw fractured, and united ante-mortem.

Vol. I, page 53. First left bicuspid has three root-canals.

Vol. I, page 57. Left cuspid has phagedenic pericementitis on labial surfaces.

Vol. I, page 66. Confusion of the two inferior central incisors.

Vol. I, page 68. Lower jaw broken away ante-mortem in region of the third left molars.

Vol. I, page 72. Upper second right molar has pulp-chamber exposed.

Vol. I, page 77. The process, both on palatal and buccal surfaces, in the region of the first and second left molars gone.

Vol. I, page 83. Diastema between lower left bicuspids.

Vol. I, page 98. Lower left cuspid is bicusped, so there are three bicuspids on the left side.

## COLLECTION OF ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

Vol. I, page 8. Molar deficient ante-mortem; asymmetry of the jaw to the right.

Vol. I, page 87. Partial division of the crowns of superior central incisors.

Vol. II, page 11. Partial division of the crowns of superior second bicuspid and first molar.

Vol. II, page 15. Superior left cuspid between central and lateral incisors.

Vol. II, page 48. Both inferior lateral incisors inside of alignment.

Vol. II, page 88. Superior right first molar below the level of the other teeth.

Vol. IV, page 85. Diastema at the superior right second bicuspid and first molar.

Vol. IV, pages 94 and 99. Perfect.

Vol. V, page 37. Cuspids imbedded in the jaw.

Vol. V, page 50. Diminution of the lower central incisors.

Vol. V, page 72. Superior only, and perfect.

Vol. VII, page 58. The intermaxillaries in this skull are vertically deficient.

Vol. VII, page 60. Superior left central included.

Vol. VIII, page 21. Portion of the lower jaw containing the first right and left bicuspids elevated, so that the cervical border of the bicuspids is on a level with the crowns of the rest of the teeth.

Vol. VIII, page 55. Intermaxillary imperfectly developed.

Vol. VIII, page 56. Supernumerary tooth is badly eroded.

Vol. VIII, page 72. Very large cyst on the anterior left portion of the palate.

Vol. VIII, page 83. Asymmetry of the jaw.

Vol. IX, page 10. Upper and lower jaws perfect.

Vol. IX, page 26. A fourth molar is appearing behind the third molars, on either side of the superior jaw, and one supernumerary tooth on the lower right side between the bicuspids.

Vol. IX, page 40. Right third molar is rudimentary.

Vol. IX, page 90. Confusion of the second and third left molars.

## ARMY MEDICAL MUSEUM, WASHINGTON, D. C.

Vol. I, page 3. Diastema between first and second, right and left superior bicuspids. Lower left first molar, partial division of crown.

Vol. I, page 4. The roots of the upper right second molars are fused.

Vol. I, page 5. Diastema between the right bicuspids. Alveolar arch badly handled.

Vol. I, page 12. Several teeth broken and enamel chipped

Vol. I, page 14. Partial division of superior right third molar. An unusual arch diverging at the third molars, which are very large.

Vol. I, page 26. Crowns of superior right and left first molars partially divided, also right and left lower second molars.

Vol. I, page 29. The superior right third molar very large and round, with a projecting center. Confusion of the superior central incisors; partial division of the crowns in three of the third molars; the upper right third molar diminuted.

Vol. I, page 31. A superior cuspid is a small tooth and does not belong to this subject, and the left lateral incisor is evidently a misplaced tooth.

Vol. I, page 32. Well-shaped but prominent teeth. Diastema between superior left lateral and cuspid and lower left bicuspids.

Vol. I, page 34. In the lower jaw there is a bicuspid in the place of left cuspid, which does not belong to the series.

Vol. I, page 36. Remarkably well-developed jaw. Very perfect articulation. The decayed bicuspids a marked peculiarity.

Vol. I, page 42. The teeth of crania are badly mixed. Teeth put in any kind of position; a bicuspid in third molar socket, a bicuspid for a central, etc.

Vol. I, page 57. Lower jaw does not belong to the upper, and the lower teeth are of an older person.

Vol. I, page 58. Perfect set of teeth.

Vol. I, page 61. A number of teeth inserted where they do not belong.

Vol. I, page 72. Perfect specimen.

Vol. I, page 73. Lower jaw does not belong to this cranium.

Vol. I page 82. Lower jaw evidently does not belong to specimen.

Vol. I, page 85. Very large inferior central incisors, and second molar has been transposed or changed.

Vol. I, page 87. The left inferior incisor not as large as the right. A very broad arch.

Vol. I, page 94. Very perfect jaw and teeth; superior left lateral incisor has partial division of the crown.

Vol. II, page 8. Several teeth have been misplaced or exchanged.

Vol. II, page 21. The superior lateral incisors resemble a peg. Both upper and lower incisors are very small. The inferior third molars are well developed.

Vol. II, page 23. Fine specimen, roughly handled.

Vol. II, page 25. Teeth in lower jaw worn down into pulp, and all of them abscessed with the exception of one.

Vol II, page 40. Lower jaw does not belong to skull, and teeth have been exchanged.

Vol. II, page 44. Teeth very nearly worn into pulp-cavity. Diastema between the superior central incisors.

Vol. II, page 56. Small round incisors. Specimen very old.

Vol. II, page 71. Superior lateral incisor has partial division of the crown.

Vol. II, page 61. Very old and badly worn specimen. Diastema between the superior central incisors.

Vol. II, page 75. Lower centrals have been changed.

Vol. II, page 77. Several teeth in wrong position.

Vol. II, page 85. Very small round incisors. Teeth badly worn.

Vol. II, page 89. Some of the few teeth left are misplaced.

Vol. II, page 92. Several teeth put in that do not belong to skull. One diastema between the central incisors.

Vol. II, page 95. Diminution of the first right superior bicuspid; and is an old upper, but a young lower jaw.

Vol. III, page 11. Upper teeth all lost and some lower misplaced.

Vol. III, page 18. Teeth worn into pulp.

Vol. III, page 22. Peculiar small round teeth.

Vol. III, page 26. The lateral incisors placed where the centrals should be.

Vol. III, page 41. Diastema between superior central incisors.

Vol. III, page 42. Set covered with a black substance. Diastema between superior second bicuspid and first molar.

Vol. III, page 52. Teeth blackened and filed.

Vol. III, page 65. Imbrication of succedaneous teeth; two superior temporary molars, no second bicuspids. Superior left third molar resembles a bicuspid.

Vol. III, page 70. Diminution of the superior left cuspid.

Vol. III, page 75. Inferior incisors very small.

Vol. III, page 80. Remarkable development of enamel of lower right first bicuspid.

Vol. IV, page 1. Very perfect.

Vol. IV, page 46. Several teeth put in wrong places.

Vol. IV, page 55. Front teeth filed and black.

Vol. IV, page 56. Upper teeth filed.

Vol. IV, page 59. Perfect teeth, both in size and shape.

## CHICAGO MEDICAL COLLEGE, CHICAGO, ILLINOIS.

Vol. I, page 63. The remaining teeth in lower maxilla are abraded one-half their length.

Vol. I, page 68. Teeth all sound; three lost post-mortem.

Vol. I, page 69. Diastema between lower left lateral and cuspid.

Vol. I, page 72. Diastema between superior central incisors.

Vol. I, page 84. Diastema between superior left cuspid and bicuspid, and asymmetry of the arch.

Vol. I, page 85. Anteversion of all the succedaneous teeth.

Vol. I, page 73. Diastema between inferior right lateral incisor and cuspid.

Vol. I, page 81. Lower bicuspids have bifurcated roots.

Vol. I, page 87. Lower left cuspid has two roots.

Vol. I, page 88. Exostosis of roots of superior second left molar.

Vol. I, page 95. Asymmetry of arch. Absorption of process.

Vol. I, page 96. On the right side the lower bicuspids and molars articulate outside of the upper. Great absorption of the alveolar border.

## PATRICK COLLECTION, MISSOURI HISTORICAL SOCIETY.

Vol. I, page 1. The molar teeth become smaller to the posterior on both sides of superior set. Teeth very regular and compact. Superior teeth quadricuspid. The inferior molar teeth gradually decrease in size to the posterior. Dent on left portion of frontal bone, bony cicatrix showing same.

Vol. I, page 4. Right superior lateral incisor shows cyst extending to the palate process. Left cuspid gone, showing extensive abscess perforating antrum and forward to the ala of the nose.

Vol. I, page 5. Roots of the molars are exostosed and the border of the process hypertrophied.

Vol. I, page 6. The anterior teeth more or less abraded. The second and third superior molars right and left are tricuspid and small and of equal size, all having but one root each, or the roots connate, having no root septa.

Vol. I, page 7. Superior right first molar roots divergent, exostosed and exposed at the buccal region. Teeth worn. The second superior left malar process absorbed, exposing the roots of the teeth.

Vol. I, page 8. The roots of the first and second bicuspids right and left are bifurcated.

Vol. I, page 9. Second and third superior right and left molars are small, tricuspids of equal size, triple roots clubbed together.

Vol. I, page 10. Exostosis of the first and second right molars with alveolar cysts involving the external wall and confined to the alveolar process and not involving the palate process. The inferior incisors worn badly on their posterior surfaces.

Vol. I, page 12. Enamel horizontally grooved in the upper and lower teeth, deep vertical grooves in the upper incisors and cuspids. Left inferior cuspid elongates from loss of superior occluding tooth ; external wall gone, exposing root.

Vol. I, page 13. Exostosis of the superior first molars on buccal root.

Vol. I, page 15. Without teeth. Absorption of the process complete of the superior and inferior maxillæ. Must have lost teeth very early. On the superior maxilla the absorption extends to the nasal spine or process, etc. Right parietal and temporal gone from decomposition after burial.

Vol. I, page 16. The left superior central incisor present, but evidently the pulp was dead during life, the color indicating that fact, it being darker than the rest of the teeth submitted to like circumstances.

Vol. I, page 18. Anterior wall of the superior maxilla very thin, exposing the roots of the teeth in the region of the cuspids and molars. Diminution in size of molars to the posterior of the superior. The first inferior left molar fractured on post-lingual margin.

Vol. I, page 19. On the grinding-surfaces the enamel is worn off. The right superior lateral incisor dead ante-mortem.

Vol. I, page 20. Badly decomposed ; the few remaining teeth are good. Occlusion not determined.

Vol. I, page 21. Fracture on the lingual posterior margin of the left inferior first molar. The third molar very small on superior maxilla.

Vol. I, page 22. Rotation of bicuspids one-fourth. Buccal cusps turned in, and the right bicuspid inside arch. Horizontality of both superior third molars, and both superior third molars small. Lower teeth regular and compact. The teeth are massive.

Vol. I, page 23. The first superior molars larger than the second, and the second larger than the third. The lower teeth also smaller to the posterior.

Vol I, page 24. The superior molars become smaller to the posterior.

Vol. I, page 25. Teeth massive, very much worn.

Vol. I, page 26. Inferior left second bicuspid rotated one-half, lingual cusp to the posterior and buccal cusp to the anterior. The left third molar much larger than the right third, and rotated one-half, the buccal side to the posterior.

Vol. I, page 27. Superior molars gradually smaller to the posterior.

Vol. I, page 28. In upper jaw teeth are smaller to the posterior, in the lower jaw the teeth are slightly larger to the posterior.

Vol. I, page 29. Upper and lower teeth are worn down one-third.

Vol. I, page 30. The upper teeth from the first molars are very much smaller as they retreat to the posterior. The lower teeth from the first molars decrease in size to the posterior.

Vol. I, page 32. The teeth all good ; no decay with the exception of the inferior right second molar, buccal side. Lower molars equal size ; upper molars smaller to the posterior.

Vol. I, page 36 Great absorption of the process from the presence of salivary calculus, exposing the roots of remaining teeth.

Vol. I, page 38. The teeth on this lower jaw were lost early (ante-mortem). The roots of the right central and cuspid are fused together, the right lateral lost early, and owing to inflammation caused by the loss the fusion of the adjoining teeth followed.

Vol. I, page 42. The superior maxilla shows asymmetry of the arch at the expense of abrasion of the teeth on the right side. The right superior not worn, but elongated, showing loss of opposing teeth; the teeth on the left side not much worn. Lower jaw missing.

Vol. I, page 43. A lower jaw taken from a mound near the Cahokia Mound; this jaw reposed on a large earthenware, shallow plate; no other osseous remains were found with it. The bone shows that it had been scraped clean of soft tissue before interment.

Vol. I, page 44. Lower jaw gone. The right molar and bicuspids showing no abrasion, but elongation, owing to loss of the occluding teeth of the lower jaw.

Vol. I, page 50. Inferior second and third right and left molars, worn down on their posterior surfaces. Inferior right and left second and third molars inclining forward. The first molars upright.

Vol. I, page 52. The remaining teeth worn down below the cusps, that is, the base of the cusps. Superior left first molar ante-mortem fracture.

Vol. I, page 54. The teeth of the superior maxilla worn below the enamel. Teeth of lower jaw good, but worn down as in upper.

Vol. I, page 55. The third molars in the inferior maxilla in the process, the crowns directed to the anterior. Enamel good, cusps very little worn.

Vol. I, page 57. Upper jaw gone. Lower jaw shows abscesses; teeth badly worn.

Vol. I, page 59. The remaining teeth much worn, exposing dentine on grinding-surfaces.

Vol. I, page 60. Superior second right molar elongated for want of occlusion with its opponent of the lower jaw. Teeth all badly worn. Superior first left molar elongated from same cause. Teeth badly worn on their grinding-surfaces.

Vol. I, page 62. In this collection of teeth from Indian graves there are in box (number 62) 18 sound molars and 5 decayed molars; 26 bicuspids, cuspids, and incisors, sound teeth; 9 badly decayed incisors, bicuspids, and cuspids, one of this number exostosed. In the small box marked (62½) there are three superior molars with what is termed by Salter sunken cusps, that is nodules of enamel at the bifurcation of the roots.

The importance of this investigation cannot be overestimated, especially that portion relating to disease and anomalies of the teeth and jaws, for there is not a question that may arise in morphology, histology, or physiology on which the facts revealed in this investigation will not shed some light. A number of crania examined are recorded as "Mound-Builders" for no other reason than that they were taken from mounds. There are no valid reasons for separating the so-called "Mound-Builders" from the ancestors of the present races of Indians, seeing that we have the statements of early European adventurers that the American Indians when first observed were active mound-builders.

Many of the crania are recorded as the crania of females, without sufficient data. I have been unable to discover any anatomical difference in the male and female crania whereby the sex may be determined, nor have I found any one, after diligent inquiry, who has been able to furnish a key to the solution of the question. Size is no indication of sex.*

The depth of palate bears no proportion to the size or breadth of the arch. Some of the narrowest arches have the deepest palates, and some of the shallowest palates have the broadest arches, which renders it impossible to arrive at any rule governing proportion,—a fact well known to anatomists,—for it has long been established that the size of the teeth in human beings varies, and has no proportionate relation to the size of the body; thus, small persons have frequently very large teeth, while persons of colossal size often have narrow and small teeth. Large persons usually have large jaws; but the teeth do not correspond to the size of the jaws as often as the jaws correspond to the size of the body, either in large or small persons. There are large jaws with small teeth, and small jaws with large teeth. The latter occur more frequently in small persons, while they are of rarer occurrence in large persons. It appears to be impossible to establish any rule for proportion of parts by the measurement of any portion of the human body.

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* "The female head is larger in proportion to the size of the body than the male." See "A Treatise on the Human Skeleton," by George Murry Humphry, p. 103.

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# FACIAL NEURALGIA, FROM A DENTO-SURGICAL STANDPOINT.

BY M. H. CRYER, M.D., D.D.S., PHILADELPHIA, PA.

(Read before the New Jersey State Dental Society, July 19, 1894.)

THAT there are few diseases more baffling to the practitioner than facial neuralgia, is shown by the many and differing opinions concerning its diagnosis and treatment. When, however, the cause is apparent, and can be located in optical defects, diseased teeth, etc., the neuralgia is called peripheral, and, properly combated, yields readily to local treatment. But if the cause be obscure, and cannot be traced to any peripheral disturbance, a diagnosis is difficult. A number of surgical operations, such as resection of a branch of the fifth nerve, either within or without the brain-case, removing and destroying the Gasserian ganglion, or cutting the sensory nerve beyond the ganglion, are practiced. Medical treatment is only effective when the neuralgia is idiopathic, or arises from some constitutional cause. The continued administration of sedatives and narcotics usually leads to the habitual use of this class of drugs.

The fifth pair of nerves being the ones almost exclusively associated with this affection, a *résumé* of the local anatomy is advisable. A clearer understanding of the aberrations of functions which we are to study in connection with this nerve can, I think, be had by inverting the usual order of descriptive study of its anatomical distribution by beginning our investigation from the standpoint of its peripheral terminations.

The peripheral end-organs of the fifth nerve, found, with few exceptions, in all the tissues of the face, mouth, jaws, nasal chambers, and orbits, are receivers of impressions. As the outer sentinels to this region, they are of the utmost importance to the general economy. It is necessary that they shall be of a character of great sensibility and watchfulness.

The nerves proper are white fibrous cords of various sizes, connecting peripheral end-organs with the sensorium, and also one nerve-center with another. They do not generate nerve-force, but act as conductors or conveyors of impressions. Nerve-fibers vary in size from 1-2000 to 1-1200 of an inch in diameter. Each, in section, consists of an axis-cylinder, medullary sheath, and neurilemma. The axis-cylinder is the essential portion of the nerve-fiber, being nearly uniform in diameter, and undergoing no interruption or bifurcation from near its peripheral end-organs to the nerve-center. The medullary sheath and the neurilemma with their interspaces are believed to act in a great measure as insulators and protectors to the axis-cylinder.

The ganglia belonging to and closely associated with this nerve are five in number,—the Gasserian, ophthalmic, spheno-palatine, submaxillary, and otic. The Gasserian ganglion rests in a depression on the superior part of the anterior surface of the apex of the petrous portion of the temporal bone. It is broad, flattened, and somewhat crescent-shaped, and it receives on the inner side filaments of communications from the carotid plexus and a few branches between the dura mater and the tentorium. The ophthalmic, spheno-palatine, submaxillary, and otic ganglia are situated in the regions indicated by their respective names. They properly belong to the sympathetic system of nerves, and, as in all ganglia of this class, they have three sets of fibers, communicating with different divisions of the fifth nerve, and with branches from motor nerves. It is through these ganglia that many sympathetic or reflex nervous phenomena are accounted for. The sensorium of the nervous system is situated within the brain-case, and in it must be the common center of sensation.

The ultimate number of sensitive nerve-filaments of the fifth pair is estimated on either side at thirty thousand. Beginning at the periphery, they converge and unite into bundles, which are covered by an envelope. These bundles form branches, which in turn unite, making three great divisions, named the ophthalmic, the superior maxillary, and the sensitive portion of the inferior maxillary. These as trunks enter the brain-case respectively through the anterior lacerated foramen, the round and the oval foramina. All three perforate the sphenoid bone. After passing into the cranium, they enter the Gasserian ganglion at its anterior aspect. Issuing from the ganglion, they are united into what is known as the posterior or sensory root of the nerve. This extends backward through the pons Varolii to the floor of the fourth ventricle in the medulla oblongata.

The reception of impressions, whether of sight, sound, taste, smell, or touch, is caused by irritation of the special end-organs of sensory nerves. The sensation is carried by the nerve to the sensorium ; for example, the sense of sight. The end-organs of the optic nerve are found in the retina. As the various types of light pass through the eye, they strike the retina and cause stimulation of the rods and cones. The effect is in accord with the amount and quality admitted. Thus received, it is conveyed through the nerve to the centers of vision.

I once heard a well-known physician ask a celebrated professor of neurology, after he had delivered a lecture, "What is neuralgia? What is pain? What is it that feels?" It created a most interesting discussion, but the questions are still unanswered, and remain a problem referable to the special domain of physiological psychology.

Can we say positively where the true line of demarkation is, between a pleasurable sensation and severe pain? I think not. Of course, at the extreme of each sensation there is decidedly an intrinsic pain or pleasure ; but where is the line to be drawn? As each man has a different standard of happiness, so must his ideas of pain or pleasure vary. The simple pleasure of the laborer would be exceedingly tiresome to the man of more refined taste.

Satiety always produces disgust; pleasure, if carried to excess, becomes unendurable. Suppose one listens to a beautiful strain of music, have this same strain continued without variation for a length of time, and it will become monotonous and even painful. It is the same with taste and other sensations.

From the dento-surgical standpoint, facial neuralgia is recognized as being caused by undue irritation or disease of the peripheral end-organs; by injury, compression, or disease of the nerve-fibers between the periphery and the sensorium; by reflex or sympathetic action; by disease or compression; and finally by disorder of the general system.

In order to better illustrate nerve-irritation, we will examine the general workings of an electrical bell circuit, comparing its action with a corresponding action in the nervous system. The battery will represent the force-generator or the nerve-center; the push-button, end-organs; the insulated wires, nerves; and the indicator, the motor periphery. By pushing the button the wires convey the impression to the indicator, which will tell what button is to be answered. Now, if we look at the nervous system in the same way, the end-organs, being irritated, convey that impression to the nerves, which carry it to the sensorium, and we have something like sixty thousand push-buttons, nerves, and receivers of impressions in the system of the fifth pair of nerves. If by some accident or disease the button or end-organ become disarranged, there would either be no response or we might have a constant irritation, according to the nature of the disturbance; but if the parts are in normal condition, the sensation will cease at the moment the pressure or the irritation is removed.

Should the nerve itself become diseased, as in neuritis or from the formation of a neuroma, or be in any way unduly compressed, so as to overcome the effects of the insulation of the axis-cylinder, pain will be felt referable to the end-organs. A common example of this is the striking of the ulnar nerve against the elbow-joint, vulgarly known as the "crazy-bone." Pain will be felt in the hand at the parts of the end-organs belonging to the nerve-fibers compressed. In taking the wires of this system before you, and compressing them sufficiently to overcome the insulating properties, we will find that the indicator rings and denotes by its letter that either the button or the wire belonging to it has been disturbed. The electrician would examine the push-button and wires, and on finding the trouble, repair the injury. If he have not the power to do this, a more experienced one is called for aid. The dentist or surgeon holds the same position in relation to the human body in case of neuralgia. If he have not the ability to make a complete diagnosis from the end-organs to the sensorium, either by direct examination or by inductive reasoning, he should call to his aid the best assistance obtainable.

The diagnosis of facial neuralgia and locating the cause are of great importance, and among the most difficult problems the surgeon has to solve. Diagnosis by exclusion, or in other words ascertaining what a thing is by eliminating what it is not, is the best method. As neuralgia may be confounded with other diseases, each of these must first be excluded. For instance, the possibility of its being a case of neuritis. In determining the nature of this case, all signs of inflammation must be considered, and if not found, that disease can generally be excluded. After convincing oneself that the case is one of neuralgia, determining the cause is the next step, and here also the process of exclusion should be followed. It is my opinion that the peripheries of the fifth nerve should be exhaustively examined. The care of the mouth should be in the charge of a competent dentist, and I mean by this word all that is properly included in the term stomatologist; each tooth being examined for hypersensitive dentine, superficial and deep decay, exposed pulps, fillings that are irritating to the pulp, pulps in any stage of inflammation, whether they be in sound or decayed teeth, or in one that has been filled. The remains of roots, and whether a fistula opens to them or the gum-tissue has grown over them; normal and even supernumerary teeth that have not been erupted must be determined. I present for your inspection three teeth, a cuspid, central, and a lateral incisor, which were found on opening an antrum in search for a cause of neuralgia; the three perfect crowns were protruding into the antrum, while the imperfect roots were imbedded in the anterior portion of the inner walls. After their extraction the neuralgia ceased. Sometimes teeth in apparently healthy condition may be dead and have caused abscesses that are no longer connected with them, some of which may have opened into the antrum, the pus burrowing under the muco-periosteum of that cavity, elevating it until it closes the opening between the antrum and nasal cavity. This is one source of neuralgia. Cicatricial tissue must also be looked upon with suspicion. In fact, the mouth and its surroundings must be put in such condition that it can be excluded as the cause of the disease under consideration.

An examination should be made over the entire region of the branches of the nerves. It should be ascertained if the patient has at any time received injury of any kind in or about the head or face. This causes neuralgia not infrequently by having some of the nerve-filaments caught in a cicatrix, or they may be compressed against bony structure. Failing to localize an injury, the constitutional diseases should next be surveyed,—gout, anæmia, rheumatism, malaria, syphilis, catarrh, etc., any and all of which cause neuralgia. Gout and rheumatism, however, seldom produce neuralgia of the head; but malaria, syphilis, and catarrh are common causes. If the patient is suffering from any of these complaints, it should be treated and cured as a step in the diagnosis.

Not until all external and constitutional causes of neuralgia have been excluded is the surgeon justified in opening the face or brain-case for a resection or the removal of the Gasserian ganglion. A tendency of the general surgeon of to-day is to disregard the importance of thorough examination and correction of the discoverable diseases, especially those of the mouth, and he may, in consequence, perform an extensive operation regardless of disfigurement or the risk of losing his patient.

Dr. Edward C. Kirk relates the following case which shows such an oversight or ignorance. A patient suffering from neuralgia was sent to him by a well-known rhinologist and laryngologist to have the mouth carefully examined for an etiological factor in a neuralgia.

Dr. Kirk found three lesions, any one of which could have caused the whole trouble. He made a report to the specialist, and arrangements were made to have him remove the cause of local irritation within the mouth. While awaiting the time for operation the patient was seen by his family physician, who strongly and successfully urged him to call a general surgeon, who at once disapproved of the slight operations within the mouth. He advised and obtained consent of the patient to an operation for resection of a nerve-trunk. I have not the least doubt that there is not a member of this organization who has not relieved what appeared to be an obscure case of neuralgia by finding and curing some lesion of the mouth. The eye, ear, and nose specialists have had similar experience, all of which proves that the peripheral causes of neuralgia should receive the closest attention before searching for the obscure causes. In many instances a patient goes from one specialist to another, receiving possibly temporary benefit from each, but sooner or later the old pain returns, and there is no peripheral cause left upon which to speculate ; it is then that difficult and delicate surgery is necessary.

The two cases to be detailed later are illustrations that the surgical operations of resection should be the last resort. In the first case, that of Mr. B., it was not until the eleventh operation that the true lesion was found in neuromata, but these growths before operation gave no indication of their presence.

After an experience of fifteen years in the special studies of diseases and surgery of the mouth, face, and neck, I have become more thoroughly convinced each year that it will be the properly trained scientific dentist who will not only cure facial neuralgia, but to a great extent prevent it by judicious work. The entire nervous system is a highly organized complexus of elements, less understood than the other great anatomical divisions. Nerves being nourished, like other tissue, through the vascular system, are subject to inflammation. When a portion of their structure is called upon for action, more blood is required in the parts, the nerves, especially the nerve endings, are stimulated, and the tissues surrounding them become hyperemic. This may be seen when an inflamed pulp is punctured ; there will be, in addition to the vascular, greater change in the nerve-tissue. Like other tissue, if unduly overworked, disease will result; in some cases hypertrophy, in others atrophy. The nerves of the teeth pass through foramina and canals within hard bony structures ; if they increase in size they will become impinged upon, the irritation causing an excess of blood in the parts. The lesson to learn from this is that any operation should give as little pain as possible, and after its completion there must be nothing left to cause further irritation, whether it be a bridge, a pulp-capping, or a filling placed in such a position or of such a character as will cause pulp-irritation. We are so accustomed to find pain passing away in a few days that we often forget that all patients are not alike.

There are two cases to which I wish to draw your attention. The first I reported to the World's Columbian Dental Congress, and think it of enough interest to repeat, especially as another sixteen months have passed away with no return of pain. Mr. B. had been suffering for many years, and after the possibility of any peripheral trouble was excluded, had had eight distinct and separate operations performed by some of the most skillful surgeons for the relief of facial neuralgia in the inferior maxilla. On October 8, 1892, he came before the clinic of the Hospital of Oral Surgery, and the following operation was performed. The lower lip was divided at the median line to the lower border of the mental process, and an incision made on the line of the bone to the insertion of the masseter muscle. The lip and cheek were then dissected from the bone, and the inferior dental canal opened by suitable burs driven by the surgical engine. The nerve was cut from the canal and the soft parts readjusted. On recovery from the effects of the anesthetic, the patient felt no relief. The seat of the pain seemed to be in the body of the bone, especially on the inner side, so that on the following Saturday, October 15, it was thought advisable to reopen the parts, and by the use of the engine bur the greater portion of the body of the bone of the left side was then removed, but no relief was obtained. Time was given for the parts to heal and the patient to recover from the shock, also in the hope that the pain might pass away, but it became, if possible, worse. The patient's sufferings were so intense that he would throw himself on the floor and cry for relief. Finally it was decided to perform an operation which I had suggested, and which was first performed at the clinic of the Medico-Chirurgical Hospital February 14, 1891 After deepening the sigmoid notch by the use of a barrel-shaped engine bur, the inferior maxillary nerve was fully exposed. The patient, well under the influence of ether, did not respond to the cutting of the bone or other tissue, but as soon as the nerve was seized by hemostatic forceps he exhibited by his movements and outcry the agony of pain. The nerve was drawn out of the inferior dental canal and cut off as high and near the oval foramen as possible. Upon the section of the nerve removed there were two large and distinct neuromata, the lower one being impinged upon by the triangular process of bone at the opening of the inferior dental canal. The upper one lay under the external pterygoid muscle. Beyond a doubt, here was the cause of the present neuralgia. It would be an interesting question to decide if it were the original cause. I have doubts of this, however, and think it more likely that the trouble had its incipiency in or about the jaw, which causing peripheral irritation produced vascular and nervous excitement, it being carried to such an extent that eventually the nerve became diseased at the entrance to the inferior dental canal. The patient came from under the influence of ether without the slightest pain, and has not had a twinge up to this time. This case is illustrative of a lesion in the course of the nerve, although the sensorium indicated it to be in the lower jaw, the latter being the seat of the peripheral end-organs of the nerve-filaments affected by the neuromata. If the patient had received no benefit from this operation, the next would have been the removal of the Gasserian ganglion.

The other case is one of greater interest to us, not only from a dento-surgical standpoint, but that the patient is a brother practitioner of dentistry. For me he holds other bonds of union, as he was formerly a student of mine. I have assisted in performing nine extensive operations in and about his head, face, and jaws, the last one being the removal of the Gasserian ganglion. His case of neuralgia has been one of almost constant study for thirteen years, upon which chapters could be written, but time will allow but a brief mention. Those who are further interested in the case can find an account of it in detail in the Transactions of the Philadelphia County Medical Society for 1894, in which will be found an admirable report by the gentleman who removed or destroyed the Gasserian ganglion so successfully, Professor W. W. Keen, M.D., of Philadelphia. There is also an extract of this report to be found in the *International Medical Magazine* for May, 1894, to which I am indebted for the greater portion of the following:

J. T. K., male, aged forty-two years. Until his thirtieth year was in excellent health, and had no indications of any tendency to neuralgic disease.

In 1880, without any previous warning, he had a sudden attack of violent pain in the right upper jaw, nearly limited to one tooth. This came on during a meal. The tooth was extracted, but the pain continued in the alveolus from which the tooth was drawn, until it healed, when it transferred itself to another tooth, and the process was repeated until three were extracted. But one of these, the second molar, which had been filled some years before with tin and amalgam, was found in an unhealthy condition.

The next operation consisted in cutting loose the gum from the bone for the whole depth of the process, both on the palatal and buccal sides, as it was supposed by Dr. Levis that the pain was caused by the gums contracting so as to press tightly upon the nerve-radicles. This operation gave no relief.

After suffering agony for some weeks, the upper teeth were extracted, one cuspid being broken and giving rise to necrosis; the root and a portion of necrosed bone were removed afterward by Professor Garretson.

For a short time the pain in the face was relieved, but became finally so very severe in the region of the infraorbital foramen that Professor Garretson cut down upon the infraorbital nerve and removed all the portion anterior to the foramen. This was in September, 1881.

In the spring of 1883, pain returned in a small area in the side of the upper jaw, and the sixth operation was undertaken by Professor Garretson, a portion of the upper jaw being removed, exposing the antrum. The patient had comparative ease until the fall of that year, when the pain returned, and he was treated during the succeeding four or five years without much relief.

In the winter of 1887–88, he suffered as only neuralgics do. Professor Garretson made a resection of the second division of the fifth nerve near the foramen rotundum.

In March, 1889, the third division of the fifth nerve was resected at the foramen ovale by the same surgeon. This gave much relief, but the pain soon returned, and the ninth operation, the ligation of the facial artery, was done in 1890. In September of the same year, the tenth operation, an excision of nearly all the superior maxilla, took place. In September, 1891, Professor Garretson did the eleventh operation, opening, at the patient's request, the inferior dental canal, and removing the nerve as far forward as the mental foramen.

From most of the operations the patient experienced some temporary relief. On admission to the Orthopædic Hospital, in May, 1893, he was suffering from three or four paroxysms of severe pain a day, for the relief of which he was taking half a grain of morphin twice a day, and more if the attack was too painful to bear.

The removal of the Gasserian ganglion was proposed by Dr. Keen, but as the patient preferred that another operation upon the inferior dental nerve should be tried first, Dr. Keen consented to this, and on June 10, 1893, that operation was performed.

The operation not giving relief, on the 28th of August Dr. Taylor removed the tissues about the infraorbital foramen, but with only temporary relief, the pain returning, and not being relieved by even large and frequently repeated doses of morphin.

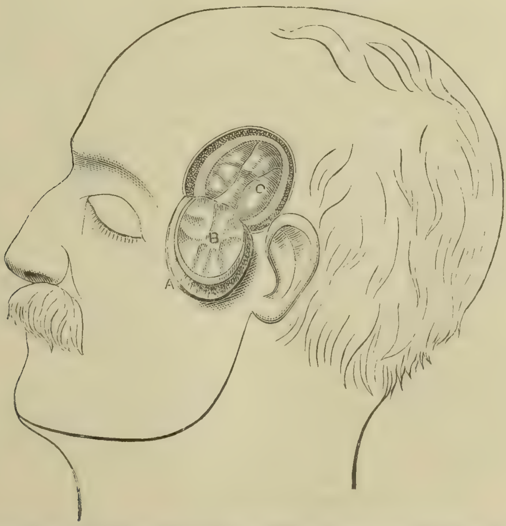

Diagram of fenestrum in brain-case in the operation for removal of the Gasserian ganglion. A, reflected scalp; B, section of bone turned back; C, cerebral convolutions.

On October 18, 1893, Dr. Keen made an omega-shaped incision, the length of which, vertically, was three inches. One leg terminated immediately in front of the tragus, the other just in front of the anterior and middle third of the distance between the external auditory meatus and the external angular process. The temporal artery was cut, and this and a few other vessels required ligation. Dr. M. H. Cryer, with the new surgical engine of The S. S. White Company, using a circular saw of one and a half inches in diameter, with a guard, then rapidly and very successfully divided the external table, excepting at the two extremities. Here, fearing perforation before the inner table and the rest of the area were divided, Dr. Keen chiseled through the superior four-fifths of the section, passing through the inner table with ease, and then chiseled the extremities. At the posterior terminus, when giving but a light blow with the mallet, the chisel suddenly penetrated the skull to a depth of perhaps half an inch, and immediately a considerable hemorrhage occurred, showing that the posterior branch of the middle meningeal probably had been cut.

Dr. Keen said, "I then chiseled quickly through the anterior extremity, broke the bone, and reflected the flap. Here again was an additional trouble, for the anterior branch went through a distinct canal at the anterior inferior angle of the parietal bone, and of course was torn and bled freely as I turned down the flap of bone and scalp. A finger over each artery, however, almost controlled the hemorrhage, and in a very few moments I was able to place a pair of hemostatic forceps on each. A cut was seen in the dura corresponding in length to the width of my chisel. A small, curved Hagedorn needle was then passed first around the anterior branch of the dura, then the posterior branch was caught. The opening in the dura was sutured by catgut. The middle lobe of the brain was then lifted with care and great gentleness from the bone, but this was followed by hemorrhage which might well be called alarming. Lifting up the middle lobe with a spatula, I discovered that it was not as I had feared, from the middle meningeal ruptured at the foramen spinosum, but that the blood came from the neighborhood of the ganglion. I could not think, with the gentleness I had used, that the cavernous sinus had been ruptured, but at all events the flow was too free not only to not allow of removal of the ganglion, but the man's life would be jeopardized. The hemorrhage did not yield to hot water. I packed the wound twice with gauze, which arrested the bleeding temporarily, but on removing the gauze hemorrhage was as profuse as before. Therefore I packed in a considerable piece of iodoform gauze and closed the flap by six retention stitches, with the intention of removing the packing in two or three days, and then removing the ganglion."

Without any marked symptoms occurring, the wound, which was partly united, was reopened on the third day and the gauze carefully removed, a stream of hot water being used to loosen it.

The hemorrhage, which was slight, was readily controlled by small hot sponges. The cavernous sinus and the middle meningeal artery were both found intact. The second and third division of the fifth nerve, and also the flap of the dura which covered the ganglion, were soon found, though great trouble was experienced in separating the third division from the middle meningeal, as they were very close together. Moreover, both at the second and third divisions, the slightest touch of the blunt hook, Allis's dissector, scissors, knife, anything, produced the sudden escape of at least a drachm of blood, which obscured the field of operation. Pressure by a small gauze sponge for a very few moments would cause the bleeding to cease, but the slightest manipulation produced its recurrence. However, after cutting both of these nerves and tracing them back to the ganglion, the little extradural sac was torn open, and with the Allis dissector and a small sharp spoon the ganglion was thoroughly destroyed.

The wound was then closed and the usual dressings applied. The patient's condition, both throughout the operation and at its end, was decidedly better than in the operation of the 18th.

He made a complete and rapid operative recovery, and was out of bed on the fourth day, the entire wound being healed. The highest temperature was 101.2° F.

At first it was feared that permanent injury would follow, as he suffered from delusions, aphasia, and other symptoms, but fortunately these all passed quickly away.

The engine used in this case, as described by Dr. Cryer, is comparatively a new one, having been made during the last summer ; it embodies suggestions of his own in regard to giving great power, speed, and steadiness ; the hand-piece has also been arranged so that different guards and cutting instruments can be readily and securely placed, the engines which have been heretofore used lacking these qualities.

Of the saw and guard used in making the initial section of the brain-case for the operation above described, Dr. Cryer said, "The guard is set by the thumb-screws, fixing the depth the saw shall cut. In this case it was the intention to cut through the outer table and diploe, but not through the inner plate ; this was successfully accomplished, and with rapidity. The inner table was broken by Dr. Keen, using mallet and chisel. This operation, as well as carefully conducted experiments on the cadaver, demonstrated that this instrument was not all that was wanted for opening the brain-case, the difficulty being that skulls vary in thickness, not only in different subjects, but in individual cases. The cutting instrument should be so devised that both tables can be cut without danger to the dura, regardless of the thickness of the bone and without the subsequent use of mallet and chisel. In order to overcome this objection, I have devised the spiral osteotome and guard, for a description of which see DENTAL COSMOS, January, 1894, and November, 1894."

The following is from a foot-note in Professor Keen's report of the "J. T. K." case, recited above : "In a later case at the Jefferson Hospital Dr. Cryer kindly used this instrument (the spiral osteotome) for me with great satisfaction."

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# THE RELATIVE PENETRATING POWER OF COAGULANTS.

BY JAMES TRUMAN, PHILADELPHIA, PA.

(Read before the Academy of Stomatology, Philadelphia, December 10, 1894.)

THE question of the proper material for filling root-canals has been a subject of discussion and experiment for the past half-century, or since Maynard introduced the method of filling these canals with gold. In connection with this the consideration of certain agents has led to a decided antagonism in regard to the diffusibility, coagulation, and antiseptic properties and values to be placed upon these in the general treatment of the central pulp-canal, and the tubuli branching from this throughout the dentine.

It has been clearly evident that the inner tubular portion, fibers of Tomes and Neumann sheaths, form no insignificant part of the organic matter of the tooth-substance, and that death of the central organ means necessarily the death of the whole and subsequent decomposition of this tissue, or at least the central protoplasmic portion, the sheaths being almost indestructible. Hence the treatment of the pulp-canal, however perfectly accomplished, must fail to reach the microscopic elements in the tubes, and the decomposition taking place therein results in the discoloration of the entire tooth, and may act disastrously by septic emanations upon the vitality of the entire structure. The importance of this has not been lost sight of by intelligent operators, but the difficulties of manipulation have been serious. It has been plain that but two methods could be relied upon to overcome the difficulty, the property of coagulation and the diffusibility of various essential oils, aided by osmotic action. Both methods have had decided advocacy, and it is very probable that both have a positive value, the extent of which has as yet to be determined, for, as far as I am aware, the relative values of the systems of treatment have not been settled with satisfactory experimentation, or, if so, have not been divulged in the papers upon this subject. All the points defended by the writers seem almost entirely to be based on assumptions, imperfect experiments, or upon clinical observations.

The difficulties surrounding the subject, and the many errors of observation to which experimentation in this direction is liable, have led to criticism, and have thrown a shadow of doubt upon those made by several observers.

It is not the purpose of this article to enter into any contention with the two schools of thought on this subject, but rather to show, if it be possible, that the arguments maintained with so much vigor and pertinacity, that coagulation furnishes its own barrier to diffusion, is an error of observation. Further, it is desired to demonstrate that the various coagulants have relative degrees of value. This has seemed to possess some degree of importance in other directions than that of coagulation of albuminoid material in dentine.

The knowledge on this subject seems, as far as I am aware, somewhat crude; the general idea being to rest satisfied with the fact whether a certain agent will coagulate or not, and in many instances writers have ascribed this property to agents that do not possess it. There seems, therefore, good reason for an attempt to settle several questions by careful experiment.

For a clear understanding of this subject, a brief *résumé* of the opinions of various writers may not be out of place as a preface to the present paper.

Dr. G. V. Black, who has rendered valuable service in his report on the value of essential oils, makes this assertion in the discussion following a paper by Dr. A. W. Harlan on "The Action of Diffusible Medicinal Agents on Living Teeth" (*Dental Review*, June, 1891): "If it is a microbe that attacks the sarcous elements of the body, the contents of the dentinal tubules are attacked just as well. So here we need a disinfectant. What shall we use? *Certainly not one of the coagulants, certainly not one that places a barrier to its own penetration by coagulating the albumen, as does carbolic acid, bichlorid of mercury, and some others.* These are not the antiseptics you should use in this place, but something that is diffusible, that does not coagulate albumen, something we can depend upon to penetrate in the presence of albumen, and we find that to-day in the use of the essential oils."

In the report on Materia Medica and Therapeutics, by Dr. Harlan (American Dental Association, 1889), he makes the following statement: "It is not denied here that coagulants are useful medicaments in dental practice, but we maintain that in the treatment of pulpless teeth for purposes of disinfection, they are not only useless but detrimental; in fact, their use defeats the objects sought to be attained. *They coagulate the organic surface with which they come in contact*, and prevent their own diffusion."

Again, in the paper before alluded to (*Dental Review*, June, 1891), he states that "the coagulating agents simply coagulate, and leave the coagulum to become a source of food-supply to the aërobic and anaërobic microbes. . . . In all my experiments on teeth out of the mouth, the coagulators, in not a single instance, passed through the dentine; as soon as the concretion of the surface of the cavity was affected their action was stopped." After describing the method to prove diffusibility, he says, "In this manner I have found that all volatile oils and turpentine will pass through dentine and cementum, but carbolic acid, creasote, chlorid of zinc, and aromatic sulfuric acid will not pass through the dentine or cementum."

Dr. Hugenschmidt, in his paper on "The Conservative Treatment of the Dental Pulp," indorses this idea, for he states that "when we apply a coagulating antiseptic, we of course set up a barrier to the further action of the remedy, as has been *repeatedly and correctly stated* by our confrère, Dr. Harlan."

For the present it is proposed to leave these various opinions as they stand, though I shall have occasion to refer to them in the course of the paper.

In a discussion on root-filling before the American Dental Association, held at Saratoga Springs, 1889 (*Transactions*), I made the following remarks: "The question that has given me much thought for the past two or three years is that no filling of canals can be perfect. Why? Because a large part of the tooth is made up of tubulated structure, the tubuli holding organic matter, and when the pulp dies the organic substance dies and decomposition begins immediately, and the sulfuretted hydrogen occasioned by that decomposition is the principal source of trouble. What should be done? My study of the subject and the results of many experiments led me to the conclusion that it was essential to prevent this decomposition, and that this could be best accomplished by coagulating the organic tissue. The coagulant best adapted for this purpose is chlorid of zinc, because of its great affinity for water. It will follow moisture to the very extremities of the tubulated structure, and consequently change the character of the contents so that decomposition will not take place. I have kept coagulated albumen for months without change."

This quotation comprises the substance of my views held five years ago. On the principal points the same ideas are held to-day.

Dr. Edward C. Kirk, in a paper "On Coagulants in the Treatment of the Pulp-Chamber and Canals" (DENTAL COSMOS, March, 1894), takes the positive ground in favor of the use of coagulants, using the following language: "The use of coagulants, such as carbolic acid, zinc chlorid, sublimate, etc., has not only overwhelming clinical evidence in its favor, . . . but it is actually proper on theoretical grounds, and fully in harmony with the laws of osmosis." His experiments were so carefully made that they seemed, to candid minds, to have settled the question, and yet they have not proved convincing to the opposite side of the question, for reasons not as yet clearly defined, or at least not understood.

The direction of this present paper is only incidentally aimed as an answer to the assertion that coagulants act as a bar to their own diffusion, for it has to do principally with the proposition, To what extent can this coagulation be relied upon to effect satisfactory results?

The position taken by myself in 1889, that coagulants placed in the central canal would permeate the tubuli and coagulate the contents, remains true to-day, as the experiments in capillary tubes will demonstrate, and as was previously also demonstrated by Dr. Kirk, reported in the DENTAL COSMOS. It is, therefore, useless to combat the ideas entertained in the quotations of an opposing character, as they have no force. The question might be left where it was placed by those experiments, but it seemed to me there was something more to be said on this question not entered into by Dr. Kirk. Some of these points were taken up seven years ago by myself, but dropped for a more favorable opportunity to continue them.

My intention was to endeavor to show that coagulants would penetrate tubes of the minutest character possible to be handled satisfactorily, and that this penetration was independent of circulation. My earlier investigations seemed to warrant this belief. Diffusion is recognized in the living tooth as performing an important and continuous part in its nutrition. It seemed certain, as the tubulated portion of the dentine invariably imbibed finely-divided colored matter in solution, that therefore it must take up any other fluid, if of equal solubility, with the same facility. This beyond question is true; the main difficulty here being to demonstrate that the coagulation was continuous without the aid of diffusion.

The early experiments abundantly proved this to be true, but they were carried on, at the time, with difficulty.

The effort was, as before stated, to find results in tubes not exceeding a millimeter in diameter, and if coagulation occurred it must be through absolute contact of the agent with the albumen or gelatin used in the experiment. It was necessary to fill the minute tubes with the albumen and then seal the ends. Both processes were accomplished readily by nearly filling the tubes and then quickly melting the ends in a Bunsen burner. This proved entirely satisfactory. It was found, however, that the albumen in the tubes dried and contracted upon itself, leaving spaces. To meet this difficulty, the albumen was combined with twenty per cent. of glycerin. This served an excellent purpose, and proved no interference with coagulation either in large or small tubes, with all the agents known to be positive coagulants, with one exception. It was found that mercuric chlorid had little or no effect apparently on albumen and glycerin. This was repeated a number of times. It was then applied to albumen without glycerin, and coagulation was immediate. It was found, however, that glycerin simply delayed coagulation, for in the course of a few days the effect of the mercuric chlorid was plainly visible in flocculent masses.

This fact necessitated a repetition of all the experiments to determine their correctness. It was found that mercuric chlorid was the principal one of the series seriously antagonized by the glycerin.

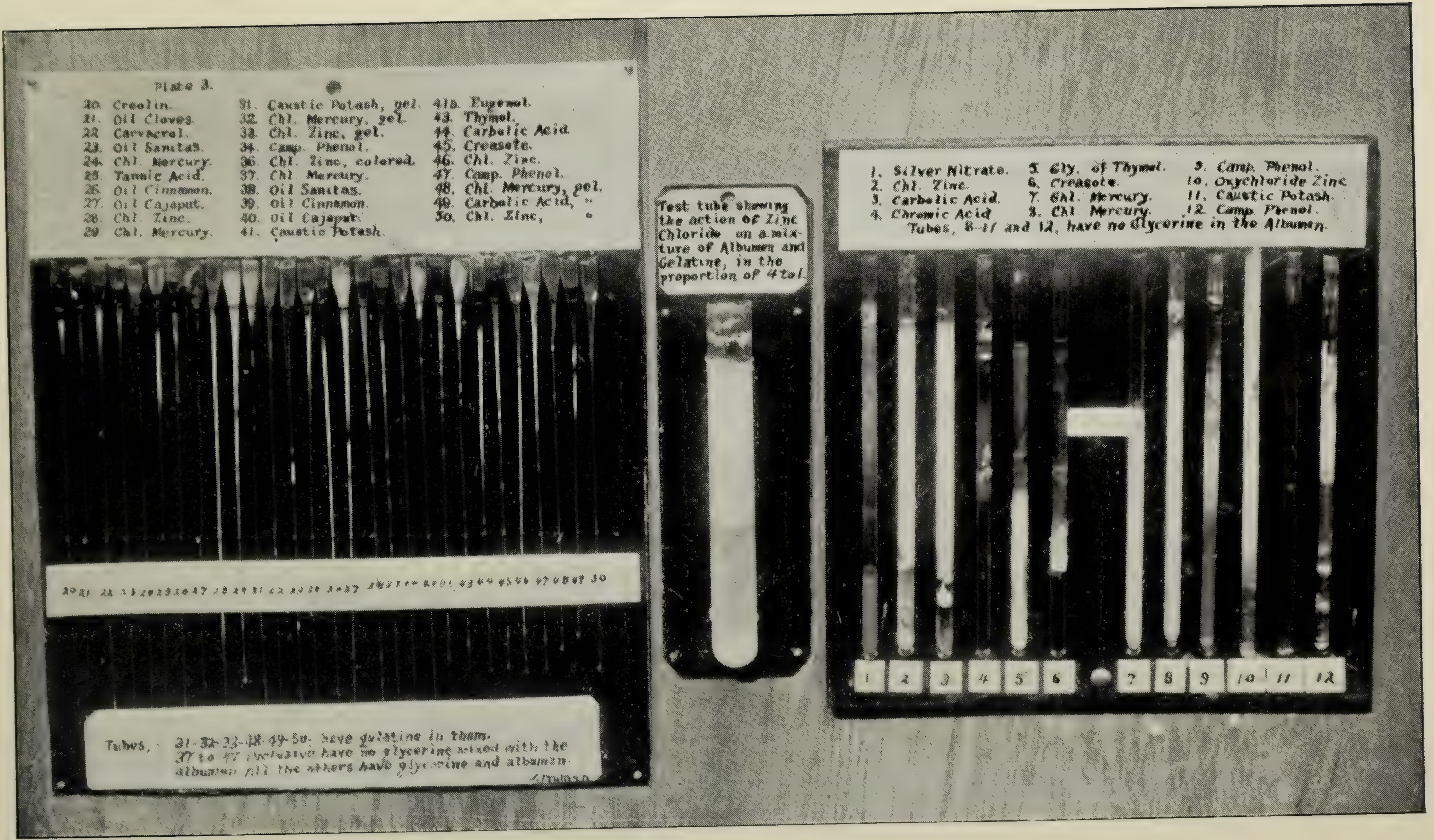
Plate 3.
20. Creolin.
21. Oil Cloves.
22. Carvacrol.
23. Oil Sanitas.
24. Chl. Mercury.
25. Tannic Acid.
26. Oil Cinnamon.
27. Oil Cajaput.
28. Chl. Zinc.
29. Chl. Mercury.
31. Caustic Potash, gel.
32. Chl. Mercury, gel.
33. Chl. Zinc, gel.
34. Camp. Phenol.
36. Chl. Zinc, colored.
37. Chl. Mercury.
38. Oil Sanitas.
39. Oil Cinnamon.
40. Oil Cajaput.
41. Caustic Potash.
41a. Eugenol.
43. Thymol.
44. Carbolic Acid.
45. Creasote.
46. Chl. Zinc.
47. Camp. Phenol.
48. Chl. Mercury, gel.
49. Carbolic Acid, "
50. Chl. Zinc, "
Tubes, 31-32-33-48-49-50. have gelatine in them.
37 to 47 inclusive have no glycerine mixed with the albumen. All the others have glycerine and albumen.
Test tube showing the action of Zinc Chloride on a mixture of Albumen and Gelatine, in the proportion of 4 to 1.
1. Silver Nitrate.
2. Chl. Zinc.
3. Carbolic Acid.
4. Chromic Acid
5. Gly. of Thymol.
6. Creasote.
7. Chl. Mercury.
8. Chl. Mercury.
9. Camp. Phenol.
10. Oxychloride Zinc
11. Caustic Potash.
12. Camp. Phenol.
Tubes, 8-11 and 12, have no Glycerine in the Albumen.
1
2
3
4
5
6
7
8
9
10
11
12

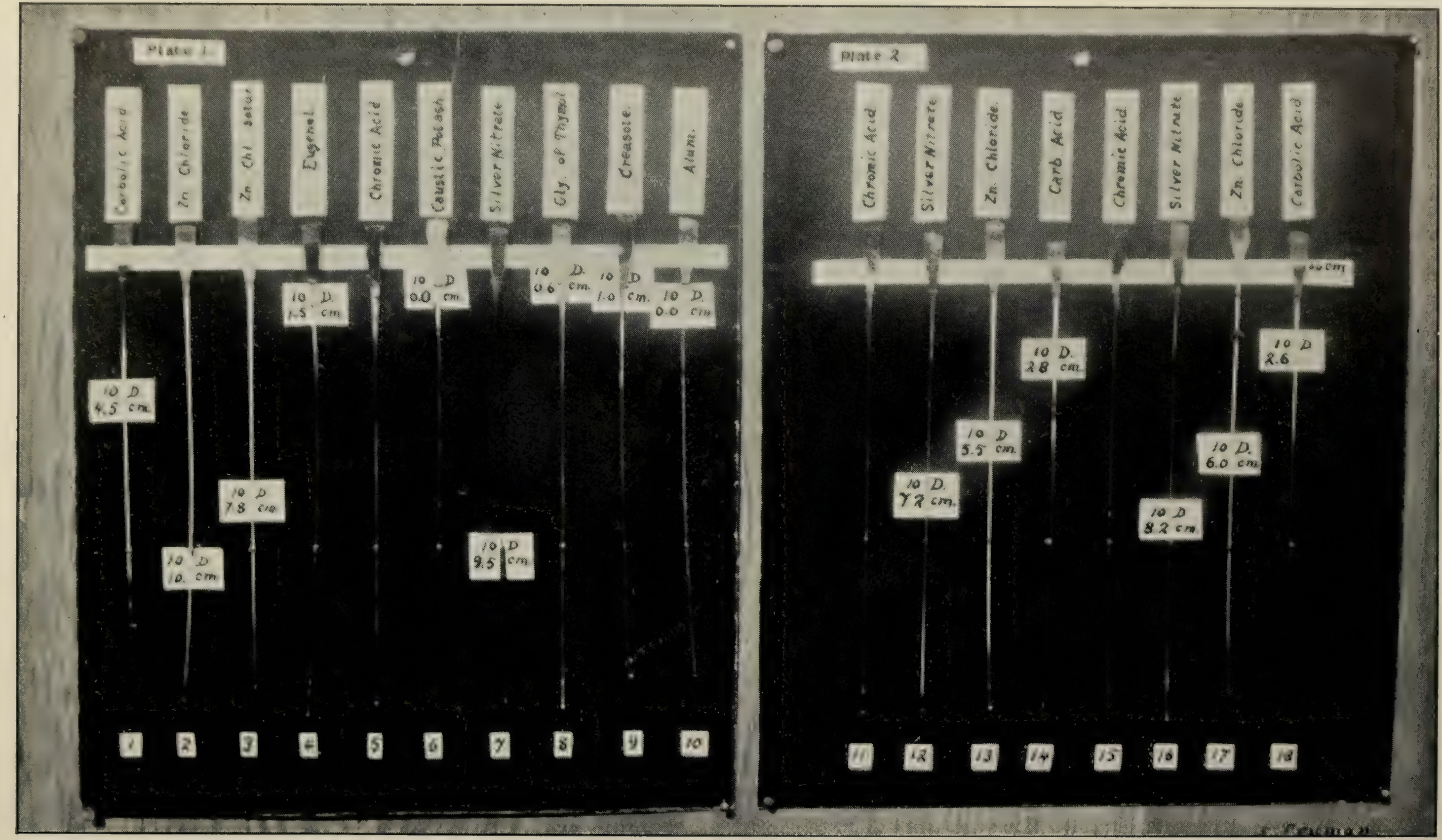

Plate 1.
Carbolic Acid
Zn Chloride
Zn Chl satur
Eugenol
Chromic Acid
Caustic Potash
Silver Nitrate
Gly. of Thymol
Creasote.
Alum.
10 D 4.5 cm.
10 D 10. cm
10 D 7.8 cm
10 D. 1.5 cm
10 D 0.0 cm
10 D 9.5 cm
10 D. 0.6 cm.
10 D 1.0 cm.
10 D. 0.0 cm
1
2
3
4
5
6
7
8
9
10
Plate 2
Chromic Acid
Silver Nitrate
Zn. Chloride.
Carb. Acid
Chromic Acid
Silver Nitrate
Zn. Chloride
Carbolic Acid
10 D. 7.2 cm.
10 D 5.5 cm.
10 D. 2.8 cm.
10 D 8.2 cm.
10 D. 6.0 cm
10 D 2.6
0.0 cm
11
12
13
14
15
16
17
18

These experiments have occupied several months, as the conclusions were not arrived at until constant repetitions, under varying conditions, had demonstrated their correctness.

The tubes were drawn to varying lengths, not exceeding, as a rule, over 0.5 millimeter in diameter. The unit of time was fixed at ten days. The first series exhibited some variation in the number of centimeters; but, as the measurements of the fluids had not been exact, it was determined to try the most important coagulants a number of times with greater accuracy. This gave more satisfactory results, showing in Plate No. 2 very little variation in duplicate, while in Plate No. 1 there is a difference of fully a centimeter in some of the tubes.

The experiments were also made to include the essential oils and many agents known to be non-coagulants, for the reason that some writers have asserted that several of these produced coagulum.

Further, the action on gelatin was examined into, but this was confined to but few tubes, and without marked result.

A portion of this work is given in the following table, representing as it does some of the most important coagulants in use:

PLATE 1.

| Number. | Size of Tube. | Material. | Strength of Solution. | Days. | Length of Tube coagulated. | Coagulation. | Color. | Material used. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.5 mm. | Carbolic acid | Full strength | 10 | 4.5 cm. | Perfect | White | Albumen and 20 per cent. glycerin. |
| 2 | 0.5 " | Zinc chlorid | Oxychlor. sol. | 10 | 10. " | " | " | " " |
| 3 | 0.5 " | " " | Sat. solution | 10 | 7.8 " | " | " | " " |
| 4 | 0.5 " | Eugenol | Full strength | 10 | 1.5 " | Imperfect | " | " " |
| 5 | 0.6 " | Chromic acid | Sat. solution | 10 | ............ | " | Brown | " " |
| 6 | 0.5 " | Caustic potash | " " | 10 | ....... .... | None | ............ | " " |
| 7 | 0.5 " | Sil. nitrate | " " | 10 | 9.5 " | Good | Black | " " |
| 8 | 0.75 " | Gly. of thymol | " " | 10 | 0.6 " | Fair | White | " " |
| 9 | 0.75 " | Creasote | " " | 10 | 1. " | Good | Orange | " " |
| 10 | 0.75 " | Alum | " " | 10 | ............ | ............... | ............ | " " |

PLATE 2.

| Number. | Size of Tube. | Material. | Strength of Solution. | Days. | Length of Tube coagulated. | Coagulation. | Color. | Material used. |
|---|---|---|---|---|---|---|---|---|
| 11 | 0.75 mm. | Chromic acid | Sat. solution | 10 | ............ | Imperfect | Brown | Albumen and 20 per cent. glycerin. |
| 12 | 0.75 " | Sil. nitrate | " " | 10 | 7.2 cm. | Very good | Dark | " " |
| 13 | 0.75 " | Zinc chlorid | " " | 10 | 5.5 " | Good | White | " " |
| 14 | 0.75 " | Carbolic acid | " " | 10 | 2.8 " | " | " | " " |
| 15 | 0.75 " | Chromic acid | " " | 10 | ...... ..... | Imperfect | Brown | " " |
| 16 | 0.75 " | Sil. nitrate | " " | 10 | 8.2 " | Good | White to black | " " |
| 17 | 0.75 " | Zinc chlorid | " " | 10 | 6. " | " | White | " " |
| 18 | 0.75 " | Carbolic acid | " " | 10 | 2 6 " | " | " | " " |

When the results of these experiments are analyzed, it is found, taking Plate 2 as the best representation, that no results were attainable with chromic acid. This was tried repeatedly in the small tubes, 5, Plate 1, and 11, Plate 2; also in 4, Plate 3 (large tubes). Silver nitrate exhibited thorough coagulation, 7, 12, 16, Plates 1 and 2, and tube 1, Plate 3. With zinc chlorid the coagulation is complete in 2, 3, 13, 17, Plates 1 and 2, and 28 and 46, Plate 3, and tube 2, Plate 4, and also in the large test-tube. Carbolic acid shows partial coagulation in all the small tubes, but complete in No. 3, Plate 4. This last tube, however, was not started properly, owing to difference in density of the two liquids causing them to mix to some extent. The variation in centimeters in ten days, Plate 2, is very slight, the lengths being, in No. 14, 2.8 centimeters, and in 18, 2.6 centimeters.

Wherever the dead white appears in small and large tubes, in Plates 3 and 4, it indicates the extent of coagulation, with the exception of tubes containing silver nitrate; in these the coagulation is invariably dark colored. No. 10 of the larger series represents the coagulation by oxychlorid of zinc, the upper portion, to the break in the continuity, being that material, and the lower portion coagulation. The tubes not clearly defined in the illustrations are those in which there was only partial or an entire absence of coagulation.

Whenever possible, the effort was made to have coagulation proceed in opposition to gravity. This is beautifully shown in the test-tube.

What does the work as a whole teach? 1. That coagulants do not prevent by their own action the diffusion throughout the entire tube.

2. That the penetrating power of such agents as creasote, carbolic acid, and zinc chlorid, those most frequently used, varies materially. That creasote is a very poor coagulant when compared with carbolic acid, and the latter, for this purpose, is not to be compared with zinc chlorid or silver nitrate.

3. That in proportion to the coagulating power of the agent will be its penetrating force, independent of gravitation.

No attempt was made to determine with exactness the penetrating property of essential oils, but if coloration is any indication, the tubes presented do not indicate that this is of much value in closed tubes; but this, it is acknowleged, may not apply in tubes where circulation is an adjunct to aid penetration.

In order to test various agents such as the essential oils, and also to repeat the tests with agents already used, as carbolic acid, zinc chlorid, creasote, etc., with albumen and glycerin, and without glycerin, and also the effect on gelatin, the series of tubes ranging from 20 to 50 were prepared.

It will be observed that creolin gives but slight coagulating effect, oil of cloves about the same, carvacrol shows slight cloudiness, sanitas oil slight coagulation, mercuric chlorid no coagulation in this tube (glycerin and albumen). Tannic acid shows extended coagulation; oil of cinnamon, action marked but limited: oil of cajuput, no result; caustic potash, no result in this or other tubes; zinc chlorid in gelatin, no result; phenol sodique, partial coagulation. On No. 36 an attempt was made to carry staining with the coagulation. Zinc chlorid was colored with carmine, with the result that the coagulation left the stain and proceeded down the tube. Eugenol is but a poor coagulator, shown in 41*a*; on thymol the effect is but slight and not continuous.

Tube 10, Plate 4, is given to show the possible action of oxychlorid of zinc on the contents of the tubuli in the dentine. The oxychlorid, of the same consistency used in filling pulp-canals, was placed in the funnel portion of the small tube. It soon hardened, but the coagulating process was marked upon the albumen. It began immediately, and has continued without interruption to the present time. The line of demarkation between the oxychlorid and the coagulation is distinctly shown. This, probably, is one of the most satisfactory of the tests, as it abundantly proves that contact with albumen is all that is necessary to produce coagulation with zinc chlorid, and if this be possible out of the mouth, how much greater must it be under more favorable conditions in the tooth.

Caustic potash was experimented upon not as a coagulant, but to observe the effect on albumen and gelatin. Though several tests were made no visible results were produced, though this does not antagonize the recognized quality of this agent as one of the most deeply penetrating and uncontrollable caustics used on the tissues.

The action of nitrate of silver in repeated tests was rather a surprise. It has generally been regarded as a superficial coagulant, but in every instance it has proved deeply penetrating and coagulating with rapidity and certainty, very nearly equal to zinc chlorid. This fact assumes some importance in connection with the use of this agent in teeth. Its rapid penetration raises the question, Can we use it without danger to the pulp in posterior teeth as has been recommended? At present I am not prepared to answer this question, but it seems as though a risk equal to that assumed in the use of zinc chlorid is taken when placed in children's teeth for the prevention of caries.

The experiments were extended to the penetration of the tooth-structure by a number of coagulating agents. A large number of teeth were kept under the action of these, the pulp-canals being first slightly enlarged and filled with the agent daily. The result has not been entirely satisfactory; microscopic examination shows decided action throughout the dentinal tubes, in several sections being nearly obliterated and indicated only by fine lines; but while this demonstrates a positive change in the organic contents of the tubes, it does not absolutely show that this has been caused by the coagulant. Thus far I have been unable to carry the stain given the agent along with the coagulation. Silver nitrate in several sections penetrated in seven days two-thirds the length of the tubes, but the extreme discoloration made it impossible to follow the individual tubes except at the extreme limit of coloration. Tests were made with a variety of stains, but with no result, the coagulation invariably separating from the stain. When the color can be carried along with the coagulation, it will visually show what may be regarded as absolutely true, that the coagulant is carried in the dentinal tubes as effectually as in those exhibited.

In the specimens prepared for the microscope, the evidence is positive to the trained eye that every tube is filled with coagulated organic matter; and this has been so frequently repeated, and with precisely the same results, that I have no hesitation in accepting it as a fact. I failed, however, to observe any change in the cementum, and I am, therefore, led to doubt the possibility of any coagulating effect in that tissue by any of the agents used.

An attempt was made to verify Dr. Kirk's experiment of cementing a tube in a tooth, sealing the foramen, and then filling the tube with an active coagulant, as zinc chlorid. Six perfectly fresh teeth were taken, tubes cemented, and foramina closed. The tubes were of varying length, the fluid in them ranging from a column of 7 to 18 centimeters. These were placed in a second tube filled with egg albumen. The result in four was that coagulation began after several hours at points indicating leakage. One of these was removed, the leak covered with paraffin, and reinserted. This has remained imbedded in the albumen for over a month without any result. In two cases, the leak evidently was not through defective manipulation, but appeared to be from an invisible crack in the enamel, and at the bifurcation of molar roots. The two specimens exhibited will, I think, demonstrate the conclusions arrived at by microscopic tests, that zinc chlorid, the agent used, cannot penetrate through the cemental tissue. If this cannot be done by the force of the column of fluid, it certainly cannot by diffusion.

The error, it seems to me, of Dr. Kirk's experiment lies in the fact that allowance was not made for leakage. It is well known to all histological workers that teeth may be more or less penetrated by cracks. These furnish a clear passage for any fluid forced into the tooth. Fresh teeth are not so liable to this defect, demonstrated by the specimens exhibited.

In the paragraph quoted from a portion of my remarks in 1889, I stated my faith in coagulation as a remedy for discoloration, and an effectual barrier to the ingress of micro-organisms into the dentinal tubes. I am still of the same opinion. The only modification I would make of these views then expressed would be that I fear the possibility of the action of the zinc chlorid upon the pericementum through its penetrating power, passing out through the foramina, if more than one exists. My observations, as heretofore stated, do not show that the use is at all dangerous if care be taken to close the upper third of the canals thoroughly before placing the coagulant in the tooth. Clinically, I have observed in one case only an action upon the pericementum which I have been led to attribute to the zinc chlorid passing through the foramen. The large clinical experience in filling root-canals with oxychlorid of zinc, now covering many years and a large number of practitioners, seems to show that it can be used without risk, provided proper precautions be taken.

In the use of zinc chlorid as an obtundent of sensitive dentine there cannot be two opinions. The experiments demonstrate, beyond cavil, that this agent for this purpose is exceedingly dangerous to the life of the pulp, and should be abandoned for that purpose.

While it is recognized that the experiments are by no means exhaustive, I regard them as demonstrating the incorrectness of the views quoted, and must further regard them as placing the question on an intelligent basis, and perhaps adding something to our knowledge as to the relative penetrating power of coagulants.

I am indebted largely to Mr. F. McS. Thomas for valuable aid in the manipulative part of the work, which has necessarily been of a tedious character.

# A PATHOLOGICAL CONDITION OF THE MUCOUS GLANDS OF THE MOUTH.

BY GEO. HOWE WINKLER, M.D., D.D.S., NEW YORK, N. Y.

(Read before the Homœopathic Medical Society of the County of New York, Nov. 8, 1894.)

WHEN a specialist, as far removed as a dentist is from the general practice of medicine, is called upon to deliver an address before a body of general practitioners, it behooves him to carefully select from his special sphere of labor such a subject as will be both entertaining and of value to his audience. With this object in view I shall present to you this evening, from the field of stomatology, a subject that has commanded and received my most careful and studious consideration ; a diseased condition that you and I meet in every-day practice ; that exists in nearly all of our patients, at some period of their lives, from early childhood to hoary age ; that is productive of great injury to the oral cavity and of much distress to the stomach ; and that is capable of successful treatment and relief without the intervention of special practice.

With this preliminary, I ask your attention to a consideration of that pathological condition of the mucous glands of the mouth, or more especially those situated on the gingival borders, or free margins of the gums, which results in the excretion of an acrid corrosive fluid that excoriates the epithelium and corrodes the teeth. I shall discuss the subject under cause, appearance, results, and treatment, and will add, as illustrations, several cases from practice. I believe this condition to be due to the elimination, by these minute glands, of hereditary poisons. All of the glands of the human body have elective affinities for such materials found in the blood as enable them to perform their normal functions. They also show a predilection for certain administered drugs ; thus we prescribe, knowing that one drug will act upon the liver, another upon the kidneys, another upon the gastric glands, and so on through the entire number. They possess a still further power for good,—the power of elimination.

The elimination of injurious or poisonous products in the blood, which products may be momentary or recurring in their presence, as in the case of the salivary glands depositing the soluble salts of lime, as evidenced by the salivary calculus in the mouth, or eliminating the chlorate of potash when administered in large doses for ulcerative stomatitis. The mucous glands of the gingival borders in a state of health secrete a clear, colorless liquid, slightly acid, which bathes the necks and crowns of the teeth, dissolving and washing away any particles of food that may lodge about them. In the exercise of their power of elimination they excrete a poisonous product which, in time, poisons the glands themselves, by its long-continued passage through them, causing severe inflammation and sloughing ; and the combined products of the sloughs and eliminations work most disastrous results in the mouth, and most injurious conditions, in many instances, in the stomach.

Now these eliminations are, as I conceive, the elimination of the subtler poisons in the system, the hereditary or those of a dyscrasia, which seldom are of criminal character. The inordinate use of calomel, the excessive indulgence in liquor, tobacco, coffee, tea, etc., are sufficient causes for transmitted weakness or defects. When physicians are obliged to call a halt upon injurious indulgences in order that they may be able to restore health, or to save even life itself in some instances, it is within the bounds of reason to expect the offspring of such acquired morbid states to inherit defective constitutions To these transmitted conditions I attribute the disease under consideration, for the reasons that it is non-syphilitic, it is not due to a want of cleanliness, it is almost universal, being found in nearly four out of five persons with whom we come in contact, the number of persons affected by it is increasing, and in the vast majority of cases it exists in patients who could by no possibility have acquired it during their own lives, either through disease, salivation, or other provocative causes.

So much for the cause. The appearance of the disease exhibits usually a line of inflammation extending along the festoons of the gums and the interdental spaces, sometimes along one or two of the molar teeth only, at other times along the palatal or lingual margins of all the teeth, and again the entire gingival borders are involved. The discoloration is sometimes so slight as to require close scrutiny to detect it ; at other times the diseased border is turgid, and purple in color ; again a crimson line marks the site of the affection, and in more advanced stages we have raw surfaces and phagedenic ulcerations.

The glandular excretion in some patients is clear, limpid, and sharply acid. The teeth appearing clean, but presenting slight erosions at their necks, which are of the same color as the teeth, firm to the pressure of an instrument but exquisitely sensitive ; or the erosions may present the chalky white appearance of rapid acid disintegration, slimy in feeling, with pits penetrating here and there along the line of decalcification, and like the first extremely sensitive. In other cases the excretion is turbid, viscid, excoriating, corrosive, and fetid or putrid, covering the teeth with a murky or yellowish slime, which no amount of cleaning can keep off while the disease exists.

The results of this disease present a number of phases. In the first place, we have slight erosions around the teeth, which are sensitive to the touch or to sweets when taken into the mouth. Patients sometimes complain that they are not able to clean their teeth or use the pick without pain, or the erosions may be more generally distributed over the surfaces of the teeth, and in the case of little children sometimes the pain is so great that they cannot sleep except under the influence of anodynes. One case that came under my observation was a little child of two and a half years of age, who suffered so much that her mother took her to a dentist, who, not knowing how to treat the case otherwise, extracted five teeth, and left the disease untouched to continue its attacks upon the other teeth, which were already beginning to show signs of its action. In other cases the destruction of the teeth is more generally distributed, the mouth being bathed in acid and the decay presenting the light appearance of acid destruction, known to the dental profession as white decay. This condition is frequently met with in the case of young people arriving at the age of puberty, from twelve to sixteen years of age ; the patients often otherwise presenting the splendid appearance of robust physical health.

I recently received a letter from a patient of mine in Denver, Col., inquiring concerning a young lady of nineteen years of age. I quote from my correspondent : " All teeth are decayed and require constant filling ; cavities will sometimes come in a few weeks ; they are all very sensitive, and some of them are also sensitive near to the gum, when touched on the outside. The dentist here says that the saliva is in an unhealthy condition, and that this is the cause of the trouble. Seventeen cavities have recently come,—that is, within two months. The dentist further says that the only thing to be done for the young lady is to crown all the roots, but advises that this should not be done until the teeth get so bad that they will not stand any more filling. She has been going to the dentist for the past three years every three or four months, so that the condition is becoming quite distressing." My correspondent adds in a postal : " The dentist says that the enamel is as thin as paper, and the teeth very soft, just like chalk."

This aptly describes the condition as frequently met with and as usually treated, except when the treatment consists in the extraction of all the teeth and the substitution of artificial dentures. The teeth are frequently covered with a tenacious slime, and the extensive decays present edges so friable as to be readily broken down by the pressure of the finger-nail. The cause of it is generally little understood by the profession at large, and their treatment of it is indescribably unsatisfactory. Cleaning the teeth thoroughly, detergent and stimulant mouth-washes, lime-water, prepared chalk, Phillips's milk of magnesia, etc., are among the usual local means resorted to, and internally acid phosphates and hypophosphites are prescribed, and that, oftentimes, when the presence of salivary calculus in the mouth indicates that there is a greater supply of soluble lime-salts in the blood than the system can utilize. These acid excretions render the mouth a more congenial incubator and home for those micro-organisms which are agents of tooth-destruction, and fulfill most completely the requirements for electro-chemical relations between the fillings in teeth and the walls of the cavities, which results in the breaking down or crumbling of those walls, especially the cervical, which is first and most continually covered by the acid.

I believe this diseased condition to be, in very many cases, the forerunner of that dread disease "pyorrhea alveolaris," and, while the complications existing there may not be always entirely combated, its treatment, in the beginning of operations, is imperatively demanded and invariably of benefit. These excretions, aside from destroying the teeth, are extremely distressing and injurious, giving to many patients a very disgusting taste in the mouth on waking in the morning, causing the breath to be most offensive, and being swallowed with every mouthful of food, and incidentally between meals, producing occasionally distressing indigestion or dyspepsia. The treatment of this disease is very simple when known, but it took me a long time to discover it. For years I recognized the diseased condition and its results, and waged against it a most unsatisfactory and abortive warfare. Its successful treatment was finally accomplished through a study of the subject that was partly the outcome of an accident. I am an allopath both by my medical and dental education, and for years exhausted the resources of that school in my efforts to combat this condition. My want of success convinced me that local or topical applications could not cure the mucous glands of the mouth any more than they could cure other glands of the human body when diseased, and I became convinced that these glands, like all others, could only be reached and cured by the administration internally of such drug or drugs as would have a specific action upon them.

The paucity of internal remedies furnished by allopathy for the treatment of diseases of the mouth, and the accidental reading of a homœopathic paper, led me into a study of the homœopathic treatment of the mouth and the remedies. Among the latter I found kreosotum, which in my four years' use of it has proved itself to be almost an absolute specific for the disease we are considering, and in consequence of the great frequence of the demand for it I consider it the most valuable medicine I have at hand in the practice of dentistry. I frequently administer it with very marked benefit for several weeks before excavating decay, for filling, in very sensitive teeth. I administer it in powders, pellets, or in liquid form, from 6 x to 12 x, prescribing that form which may be most conveniently taken by each individual, in such oft-repeated doses as will secure for them the dynamic force of the drug.

In order to emphasize the above facts, I cite the following out of a great many cases that I have treated.

*Case I.*—Mrs. J. C. C., a prominent southern lady, came to me on June 2, 1890, to have her mouth put in order. I found several cavities in her teeth, which I filled. I also discovered an extremely acid condition of the secretions, a line of corrosion around the necks of nearly all the teeth, and a sensitiveness which was almost excruciating to the touch of the tooth-brush or wooden pick, and extremely painful when sweets were taken into the mouth. I prescribed a detergent and stimulant mouth-wash, and advised that precipitated chalk be rubbed thoroughly in between and around the teeth upon retiring at night. I continued the treatment for this condition for a year, using at times lime-water and bicarbonate-of-soda washes, and occasionally inserting one or two fillings; the pain that she suffered being at no time alleviated, but always most persistent and distressing.

On June 9, 1891, a year later, having discovered my present treatment, I prescribed kreosotum in pellets, which were taken for about three weeks. In a few days after beginning the medicine she was relieved of pain, and has been comfortable ever since; and the decay of the teeth has been so arrested that it was not until July 27, 1894, that she came to me again for services, requiring then but two fillings. She was a martyr to the pain and discomfort of this disease during that first year, and during the same period required the treatment and filling of several roots and of ten cavities.

*Case II.*—Miss S. A., between eleven and twelve years of age, was sent to me by her father, in April, 1893, just before the family went down to their summer cottage at Long Branch. I put her mouth in perfect order, finishing the work on the 27th day of April. On her return to the city, she called at my office, September 30 (I mention the dates in order to show the tremendous rapidity with which this disease works injury). I was astounded by an inspection of her mouth; it presented in the short space of five months, from a state of perfect health and condition, the appearance that is met with in some of the mulattoes of the south who suffer from strumous diathesis. The teeth were covered with a dirty-yellow, tenacious slime, the mouth reeking with acidity, and nineteen cavities of decay existing. The teeth seemed literally as if they were being corroded out of her mouth. The child presented otherwise a picture of perfect physical health.

I filled fourteen cavities, and polished off four which were superficial, treating her mouth in the mean time with kreosotum 12 x, in pellets. In December, 1893, I renewed a temporary filling. On May 29, 1894, over seven months from the treatment, and just before a departure to their summer home, I examined the mouth again. There was not a cavity in it, nor a particle of slime ; the teeth were perfectly clean, appearing hard and sound, and the mouth was perfectly healthy. On their return, October 5, 1894, I treated the child again, and found but four small cavities.

*Case III.*—Mr. W. D. W., a merchant, presented himself December, 1893, suffering with subjective pain throughout the entire maxillary region. He stated that he had been suffering for three weeks with pain, which had become so distressing that he was obliged to leave his business and come to me. On examination I discovered that his teeth were not decayed in the slightest degree, but were eroded along their necks by an acid exudation from the gingival borders. His saliva was viscid, ropy, blood-streaked, and putrid. His breath was extremely fetid. I prescribed kreosotum, C.M., five powders. The pain was completely relieved in two or three days, and at the end of a week I administered kali phosph., 30 x, and one week later when I saw him his mouth was very much improved, his breath was quite pure, the saliva was almost normal, and he informed me that I had done him a great deal of good otherwise than in his mouth ; he stated that for four years he had been subject to an indigestion that waked him from sleep about two o'clock in the morning, with a pain such as might be caused from a blow in the pit of the stomach, and which lasted from thirty minutes to an hour and a half, and that when he awoke in the morning he was very much nauseated until he could wash out and get rid of the ropy, putrid saliva, and disgusting taste that was in his mouth, and that since he had taken my first prescription he had been free from both pain and nausea. I saw him a few days ago, and he had had no return ever since of that pain. His stomach had been simply poisoned by the putrid corrosive excretions of his mouth, and when I cured that condition the stomach was relieved.

*Case IV.*—Mrs. H. D. G., about thirty years of age, the wife of a physician in the United States Marine Hospital Service, came to me June 6, 1894, from the Marine Hospital at Stapleton, S. I., and complained that her teeth ached very much whenever she ate candy, of which she was very fond. I examined her mouth and found a beautiful set of teeth, none of which were decayed, but some of the molars were slightly eroded at the necks. I prescribed kreosotum, 12 x, in pellets, and gave her an appointment a week off. She came to it and bluntly announced : "Doctor, your medicine has not done me a bit of good, and Dr. G. (her husband) laughs at Dr. Winkler's little sugar pills." I rather enjoyed the joke, inasmuch as he was just to me, by reminding her of the times for taking the medicine when she would forget. I gave her another two-drachm vial of pellets, and an appointment for the following week; still her teeth were no better. I gave her another vial June 23, and urged her not to be discouraged, as I felt sure I would relieve her.

On July 16 I received a letter from her husband informing me that his wife had been quite sick for the past two weeks, and unable to come to me, but that she had taken my medicine and had improved very much, and that she would soon be up to see me. I did not see her again, but she wrote to me from Washington, D. C., to which place her husband had been ordered, explaining their move and asking for my bill. She said further, and I quote from her letter, "We got our orders by telegraph, and of course had to leave immediately. I was awfully sorry not to be able to have you finish the work on my teeth, but you certainly did them a world of good, for they have entirely gotten over that sensitive feeling and feel in every way comfortable."

In none of these cases was any local treatment used or prescribed. I depended entirely upon the treatment of the diseased glands by kreosotum, administered internally. It is a specific for acrid corrosive secretions in the mouth. One of the peculiar exhibitions of its action in several cases in which its administration resulted quite satisfactorily was the throwing out on the face and neck of an eruption, sometimes in small pimples, and again in large blotches, which gradually faded out as the medicine was continued. One patient had a most violent itching of the ears, beginning at about five o'clock in the afternoon and lasting for about three or four hours each afternoon with increasing intensity for three days; she then reported to me and I gave her sulfur m., and she was relieved. Now, is not this the stirring up and throwing out of some dyscrasia or occluded condition?

In conclusion, gentlemen, I would urge you to be mindful of the prevalence of this disease in the mouths of your patients, and I feel assured that you will be much gratified at the great benefit you will confer by treating the condition whenever you find it. I am honestly and thoroughly convinced that fifty per cent. of the cavities of decay which are found in most persons' teeth at the age of maturity could have been prevented; in other words, I believe that fifty per cent. of the decays of young people's teeth are absolutely preventable. And I think that no treatment for dyspepsia can be quite so efficient as that which begins in the oral cavity.

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## LOCAL EXERCISE AND DIETETIC INFLUENCE UPON THE TEETH.

BY SIDNEY S. STOWELL, D.D.S., PITTSFIELD, MASS.

(Read before the First District Dental Society of the State of New York, November 12, 1894.)

MR. PRESIDENT AND GENTLEMEN,—The subject upon which I shall speak to-night is one that has deeply interested me for a long time. It is one which concerns not only you and me, but all the world. It requires great moral courage to stand up and speak against one's own business interests, and yet if I could prescribe a remedy for the people of such potency as to do away with all this dentistry, even at the cost of the livelihood of the forty thousand men engaged in it in this country, I would deem it my duty to sacrifice the interests of the few for the many, and I myself return to the farm from whence I came.

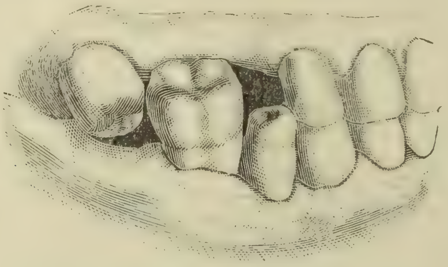
"Tell me what you eat, and I will tell you what you are." As a man eateth, so is he. Note the sallow complexion, the dull, expressionless eye of the Shaker and other vegetarians ; the clear, bright face, the rosy cheek and passionate eye of the meat-eater ; the greasy corpulence of the inhabitants of the frigid countries, who subsist upon fats, and we have examples.

Touching upon foods and their direct influence upon the human teeth, permit me to observe that among the wild animals and savages we invariably find the teeth in a state of perfect health ; this is a great observation, the great point in my paper, and from which I shall draw my lessons and conclusions.

First, it is the height of folly and presumption for us—living as we do in the nineteenth century, the most wonderful age of knowledge and science the world has ever known—to claim an understanding so far in advance of the lower animals and savages, while daily we permit our bodies to be mutilated and weakened through ignorance and violation of well-known laws. It is said that as civilization advances the human teeth deteriorate. It is not that civilization has advanced, but because we have thought to be so very wise that we have become most foolish ; while seeking knowledge believed to be so important for our existence, we have forgotten ourselves. Young children have been forced far beyond their strength into higher classes in our schools, when they should have been held back for physical strength and development.

"Health is wealth," for without health we are indeed very poor. There is no knowledge greater than to know ourselves, to understand the laws of life and health, and how to keep them. The prime factors of these great laws are two, *exercise* and *diet*. It is a well-established fact that when the use of any organ of human or comparative anatomy is discontinued, nature proceeds to eliminate the superfluous article, as is shown by the bald head. Nature provided the hair as a covering and protection for the top of the head. The savage who is always in the open air and without a hat or cover for his head is never bald. Woman wears a small, open hat, and retains her tresses, so much admired ; while man, who wears a close head-cover in the form of a hat or cap, loses his hair because it has no further use.

From the same cause, the teeth deteriorate and fall out, as is shown by the cow that is fed exclusively upon brewery grain which has been ground and cooked. She thrives for a time, and so long as the diet is continued she will grow fat ; but in the short space of two years she will lose most of her teeth, which decay, loosen in their sockets, and fall out simply from lack of use. If the cow is afterward deprived of her ground and cooked food and is given nothing but her natural diet, grass and hay, she will die in a short time, from inability to masticate ; while in the human family the dentist would insert an artificial denture and life would be prolonged. The human teeth are not exempt from similar influences, as I will endeavor to show. That *local exercise* is *first* and diet of secondary importance will be shown by facts and observations herein recorded. The value of exercise in deveoping physical strength and health was known to the ancients. The Greeks and Romans showed marked examples of the art of physical culture. It was not until the Greeks had, through their physical power, gained great wealth and luxury, that they relaxed their discipline and allowed themselves to become weak in body, that they were overcome by a poorer but physically stronger people. The training of the Romans was largely physical. They were trained for war, but they too were overcome by stronger races when they relaxed their own discipline and gave up their martial games and athletic exercises, hiring gladiators for their sports and mercenaries for their battles. The conquering races of all ages have been those strong in body. Germany keeps her men strong in the army by compulsory gymnastic drill; her schools teach gymnastics. England maintains her physical power by vigorous exercise taken by all classes. The higher classes have their out-of-door sports of the roughest and most violent kinds; the lower classes have their games. Wherever the English race goes it carries with it the love for exercise and practice of it; their women engage in it,—some follow the hound and take walks that would put to shame and leave far behind many an American man.



Showing extrusion of molars caused by disuse.

A strong body alone can beget a strong mind. Men eminent in their day and generation have been men of strong body, acquired and maintained by exercise. Examples of this could be furnished to any extent. Full breathing, causing extreme flexions of the diaphragm induced by vigorous exercise, is a most potent remedy for biliousness. An hour of vigorous exercise, walking or running, will clear up the yellow-coated tongue, which is nature's health bulletin-board. It is well known that any part of the body can be developed and strengthened by use and made weak by disuse. For example, if the arm were carried in a support and not used for one year, upon being set free it could not lift a pound nor raise itself to the head. It would, however, by exercise develop its normal strength.

Likewise the teeth, if not exercised, will become weak, as shown in the case of the cow referred to; and in the human mouth we notice the elongation and weakening of a tooth having no occluding member, other teeth having occlusion in the same mouth remaining normal (see illustration). The restoration to use of a weak tooth or root, by crowning or bridging, is a practical example of the effect of exercise. The tooth, though weak and lame at first, will in a short time develop strength and become a sound and useful member. Some years before I became interested in the science of dentistry, I observed a man past fifty years of age, who had the most beautiful set of ivory-white teeth I had ever seen; and being curious to know why he had been so blessed, I asked him the reason. He told me he had "chawed" gum incessantly from his earliest recollection; and as he was "chawing" when he said this, and was never at rest from the habit when I saw him at other times, I have reason to give credence to his statement as to his "chawing," and the cause of the fine set of teeth. Though an ignorant man, he remarked to me at the time that the habit kept his teeth clean and gave them exercise. Like the Romans, he "builded better than he knew."

Another case. A man forty years of age, an excessive meat-eater, beefsteak preferred, and three times a day not too often, being in moderate circumstances, other than tenderloins have been served at his table, and oftener that which grew very near to the bull's hind leg; and yet with a strong, clean, white set of nature's mill-stones he ground to a fine pulp his sweet morsel of beef, fitting it for a perfect digestion in a healthy stomach. He knew not the use of a toothbrush or powders, nor had he any use for the dentist, and yet his perfect set of pure white dental ivory might well be the envy of any one. This man had two sisters whose teeth were completely lost by decay, making extraction of the roots and insertion of an artificial denture a necessity before the age of eighteen years. The girls ate white bread, pies, cakes, and candies, with the inevitable result.

Another case. A patient brought two children, three and five years of age, belonging to different branches of the same family, parents on both sides having good teeth, but the children's teeth were all blackened and entirely absorbed by decay to the gum-line; and yet the children in appearance were perfect pictures of health. I asked what the children ate, and was informed that they had been weaned early, and since that time had eaten absolutely nothing but Mellin's Food and malted milk. My explanation was ready before she had finished speaking. The children had *never used their teeth.* I said if those children had never used their legs they would be withered, and they could not now walk. Their teeth were in the condition of the cow's teeth referred to.

Another case. A gentleman who had been my patient six years ago has since married and has a child four years old, and remembering that I told him the teeth should have exercise to keep them strong, put the suggestion into practice by furnishing "educator crackers" in quantity sufficient for his child to play with and build houses of. From the first day the child could put his little fist in his mouth he was furnished with these hard crackers, and upon them he exercised his jaws and cut his first teeth, consuming several crackers in a day, until at the age of four years the child was fond of the hard educators, and could easily bite one in two and grind it to powder with a perfectly strong and sound set of teeth. This child used his teeth, and they were retained for such use. Facts are stubborn things, and in view of those recorded I cannot too strongly urge the importance of *local* exercise in the preservation and maintenance of the human teeth.

There are people now living who can tell of the time when dentistry was almost unknown because little needed, while to-day there are twenty thousand dentists in the United States alone. When men used to eat largely of meat, tearing it from the bone and chewing it, eating with it coarse bread made from coarsely-ground corn and wheat, they had use for their teeth, and they were retained for such use ; but with the invention of meat-cutters and concentrated preparations of finely-ground and bolted wheat flour, pies and cakes, cookies softened in tea, soups and jellies, and the other foolish, useless conglomerations called food, nature finding no further use for the teeth proceeds to eliminate them, while an army of so-called intelligent men, twenty thousand strong in this country alone, take up their weapons against her. Year after year the great conflict goes on. Colleges and schools of learning are established which furnish many hundred recruits each year to swell this mighty army, which is fighting against nature and the inevitable, and shall we be victorious in the end? I say, no! not to the end of time, until we strike at the root of the matter and teach the people what to eat and how to eat it. We do not cure a headache by administering an opiate : though the pain may for the moment be relieved, we have not treated the cause ; nor do we cure a sore by covering it with a plaster ; nor have we done our whole duty when we fill a cavity of decay in a tooth when it is discovered. We have only repaired the damage for the moment, and the patient is left exposed as before to the same misfortune. We have given them many "*pounds*" of cure, but not an ounce of prevention.

The marked deterioration of the human teeth can be dated back to the time of the opening of the great wheat countries of the west, with the great flouring-mills which followed, and the consequent abundance of finely-ground and bolted wheat flour, which at one time was so rare that only the rich could afford the luxury, while for the last decade it has become the cheapest and most used of any article of food, bringing with it havoc and devastation to the teeth of an innocent people who knew not what they did ; nor do they realize it at the present time, as we still find white flour the staple article of food among all civilized races. It furnishes the bulk and body of all fancy pastry cooking, as well as the entire constituent of that all-important and time-honored food held in reverence above all others, and which always remains as the last morsel in starvation, *the loaf of bread*. God created the kernel of wheat and corn rich in lime for the nourishment of the teeth and bones, with starch and glucose for the soft tissues ; but man has mutilated that product of nature, depriving it of its *lime*, and setting the incomplete remainder before his fellows to eat. Consider, man, what you have done, in the face of science and facts. Note that tooth-enamel is composed of ninety-five per cent. of phosphate of lime, and bone sixty-two and one-half per cent., and that in the preparation of one barrel of white flour you have thrown out forty pounds of phosphate of lime, which should have been retained, according to a law of nature, to strengthen and build up the frame-work of our bodies. A clearer lesson or stronger example of the violation of nature's laws of health need not be presented. I may quote from Scriptural text, "Man cannot live by bread alone." But, notwithstanding all these appalling facts and statements, I claim that, although we use the kernel of wheat and corn unmutilated as it is given us by nature, with all its lime and starch, taking with it milk and lime-water with the chemically-prepared phosphates of lime, and if the kernel be finely ground and softly cooked so as to require no masticating, the teeth will continue to weaken and decay as before, proving beyond a doubt that upon *local exercise* and not upon diet must we depend for the salvation of the human teeth for the future. I also claim that all causes of dental caries which have heretofore been advanced and accepted by scientists are but existing conditions, and that lack of local exercise is the prime cause of the retrograde metamorphosis of the human teeth of the present age. Alarmists have warned us that we are fast becoming a toothless generation, and this might be the case were it not that we shall heed such warnings of our errors, and change our diet and manner of preparing it, even though we learn through the sad school of experience that we are in the wrong.

The appalling fact that forty thousand men, including those who manufacture and dispense dental instruments and supplies, are daily employed in repairing the human teeth in this country is *prima facie* evidence that there is a screw loose somewhere, that something is radically wrong. Having been brought to this conclusion, what is the remedy? The most natural question that could be asked, and the easiest to answer. Subsist upon food which requires masticating, that the teeth may have *exercise*, and, like the other organs of the body, they will develop strength and health, and will require no further care or treatment, until in future generations all teeth shall be sound in the perfect man, and the dentists shall cease because they are few.

# PROCEEDINGS OF SOCIETIES.

## FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, November 13, 1894, at the New York Academy of Medicine, No. 17 West Forty-third street; the president, Dr. V. H. Jackson, in the chair.

Dr. JAMES G. PALMER, chairman of the Clinic Committee, read the following

### CLINIC REPORT.

A clinic was held this afternoon at Lyric Hall, Sixth avenue near Forty-second street. Through the kindness of Dr. G. Lenox Curtis, Dr. STOWELL, of Pittsfield, Mass., presented a case of mistaken diagnosis. Physicians at St. Francis Hospital, Jersey City, described the case, in the summer just past, as necrosis. The case was subsequently diagnosed as impacted third molars, left superior and inferior. The patient was sent to the hospital and operated on by making incisions externally four inches long, starting under left temple and extending to lower jaw, placing in iodoform fiber and drainage-tubes, and poulticing for three days. . . . Dr. HARVEY IREDELL, of New Brunswick, N. J., demonstrated the use of Steurer's plastic gold, filling a large approximal cavity in a bicuspid out of the mouth.

He invited all present to pack the gold and test its working qualities. He inserts his filling with hand-pressure at the commencement, using the electric mallet for finishing and surface condensation. Several very beautiful specimens of fillings were exhibited which had been made entirely with hand-pressure. The surfaces of these could not be indented by running the thumb-nail across them many times in the same place. It is claimed that much time can be saved by the use of this preparation of gold. . . . Dr. WM. L. FISH, of Newark, N. J., exhibited a universal cervical clamp, which can be applied to the teeth of either jaw, right or left side. It is attached to the tooth adjacent to the one to be operated upon by a clamping device, to which is appended a slide containing a movable arm having a small receder at the end, which, through the operation of a small thumb-screw, causes the gum to be forced away, and exposes the cavity, with the advantage that the tooth to be operated upon is left entirely clear. . . . Dr. F. C. BARLOW, of Jersey City, presented a case ready for packing, showing the method of using a new automatic suction plate, by means of which it is claimed a plate can be made smaller than usual, and more like a rim-plate, and yet adhere firmly. The case was packed and vulcanized at the clinic, and is shown here to-night. . . . Dr. JOHN A. DALY, of Washington, D. C., exhibited his gold lining for rubber plates, lining, packing, and vulcanizing a case, which is also shown here. The gold lining consists of a pure gold foil, smooth on one side and crystalline on the other, of a thickness of No. 50 to 60. When the case is ready for packing the model is varnished with sandarac, then a coat of Damar varnish is placed over the sandarac, and after waiting for five minutes for the varnish to partially dry, the model is entirely covered with the gold cut into small pieces, allowing the edges to overlap. The rubber is then carefully packed on the lining, and the flask brought carefully together, so as not to disturb the gold. The case when vulcanized has a smooth gold surface on the inside. Dr. Daly claims that the gold will last as long as the rubber plate, and that it cannot be separated therefrom. . . . Dr. R. G. STANBROUGH, of New York City, presented a new right-angle attachment, having a special form of bur, which is placed in the hand-piece at the opposite end from those in general use, and securely locked, so that it cannot be dislodged in use and drop into the patient's mouth. Another advantage is a solid chuck instead of several pieces. Pressure is all on a slide-plate of hardened steel. Lost motion is taken up by an adjustable tension. . . . Dr. E. PARMLY BROWN exhibited crescent coffer-dam, shaped so as to facilitate attachment of buckles at a point near the ears instead of on the patient's cheeks. . . . Dr. W. IRVING THAYER exhibited a warm-air syringe which seems to be an improvement on many others. It has a large warm-air chamber, which can be heated up in two minutes, and will retain a heat of 110 degrees and no more for twenty minutes. It throws a continuous current of hot air. . . . Dr. T. O. OLIVER showed a number of his specialties, among them an especially tough gutta-percha. . . . Dr. JOSEPH SPYER presented a soft-rubber blank by the use of which the cutting of rubber is obviated, the time consumed in packing is lessened, and the intermediate steps are simplified. The blanks are of uniform thickness, the plates likewise, without the possibility of different-colored rubbers showing when they should not. Blanks are made in various sizes and shapes for full and partial cases, of both thick and thin material. A practical case was vulcanized for the doctor's own mouth, containing one of his automatic suction cavities.

Drs. Meeker and Holbrook, of Newark, N. J., who were announced to clinic, were unable to do so on account of failure of patients to appear. Dr. W. N. Morrison, of St. Louis, was suddenly called home, and thus prevented from operating.

## INCIDENTS OF OFFICE PRACTICE.

**Dr. F. MILTON SMITH.** I had in my practice last week a peculiar case, which I think may be of interest. A gentleman came to me at six o'clock on Saturday afternoon, saying that his brother-in-law was having a very severe hemorrhage from the gums. He was under treatment by his physician. The hemorrhage had commenced about four o'clock on Friday afternoon, and it was thought the patient had lost nearly two quarts of blood. He woke up in the night with his mouth bleeding very badly, his night-clothing covered with blood, and the bed-clothing saturated. The hemorrhage continued, notwithstanding the application of remedies that were applied externally. No operation had been performed, and there seemed no cause whatever for the hemorrhage. I found that on the right side of his mouth, between and around the bicuspids, the blood was oozing out quite rapidly. On the left side, at about the same points, I could find no wound nor apparently any cause. In a very little while his mouth would fill with blood, and he would have to expectorate. Knowing that the physician had applied different remedies without effect, the thought suggested itself to take some impression-material with me, get an impression, and make a gutta-percha plate to act as a compress. After inserting the impression-material, I thought I would let him bite up solid, and see what the effect would be. I did so, and after leaving it there until it got quite hard, I found the hemorrhage was entirely shut off. The other side was bleeding at the same rate as before. I heated another piece of compound and pressed it into the mouth in the same way. I instructed him to keep his mouth tightly closed, and when he was ready to go to sleep that they should bind his jaw tightly, so that the pressure would be continued. That was six o'clock Saturday evening. On Sunday I called on him at nine o'clock, and found there had been no hemorrhage since. I very carefully removed the plugs and found hardly any clot, and the hemorrhage had entirely stopped. It struck me as a novel idea of treatment, and the case was also peculiar in that there seemed to be no cause for the hemorrhage. I would like an expression from any one who has seen such a case.

**Dr. A. R. STARR.** A few years ago I had a case somewhat similar to the one described. The gentleman was of about middle age, and had had slight hemorrhage from the gums for several days, which was gradually increasing. He had been to a physician and a dentist, who had applied nitrate of silver and styptic solutions of various kinds without much effect. Examining carefully, I found the gums urgid and congested, and under them quite a collection of ordinary anguinary calculus. Upon removing this I found the inflammation had been so great that the pericementum had been partly separated from the roots of the affected teeth, and even the periosteum had been removed, leaving the bone slightly exposed in several places. After removing as much as I could of the calculus, which was rather difficult in consequence of the hemorrhage, I treated the case with a strong preparation of the glycerol of tannin, and upon the parts where the bone had been exposed I left a little pledget of cotton saturated with glycerol of tannin. I took no further precautions, but asked the patient to return the next day. He did so, and I found that the hemorrhage had entirely ceased, and the gums were very much improved. It looks as though this case might be due to the same cause.

Perhaps Dr. Smith's patient had what might be called a hemorrhagic diathesis. He was very likely run down in health, making this inflamed condition of the gums liable to result in breakage of the small capillaries.

Dr. LOUIS C. LEROY. I have been obliged to treat several cases of the kind described. They have yielded to treatment in two instances, and in the third instance it seems to be a chronic condition, for the hemorrhage still continues. I have been using a weak solution of iron. I would like to have a little more light thrown on the subject, because in the case I refer to the condition seems to be extending beyond the original point of irritation, which was between the central and the lateral incisors, and it has now reached to between the lateral and the cuspid. There are no calcareous deposits of any kind.

Dr. WM. JARVIE. Some fifteen years ago I had a case very similar to the one just described. I was called in to see a gentleman, after he had been treated about a week by physicians without success. The gentleman was a German of highly florid complexion ; a high liver, and his face denoted it. The blood was oozing slowly from around the margins of the gums, the least disturbance increasing the flow. In that case, I did almost exactly as has been described. The sulfate of iron had been tried, and also tannin, without success, and I made a compress in the same manner as indicated. While I stopped the bleeding, the man died within a month, not from loss of blood, but from a general diseased condition of stomach, liver, and kidneys.

Dr. SMITH. There seemed to be no history of any hemorrhagic diathesis whatever. The gums were quite healthy and solid, and I could not find a cause for the bleeding. I have reported the case to this society, thinking some one might enlighten me as to the cause of the condition.

Dr. E. PARMLY BROWN. Last year I related a case of cutting a bridge from a gentleman's mouth (a minister), which had been inserted eighteen years ago. It had been anchored to the central, and the root of the central had been absorbed. He said the bridge had been put in by Dr. Calder, of Salt Lake City. I had never heard of Dr. Calder, and could not find out anything about him. This summer I found a dentist in Sacramento who knew Dr. Calder well, and said that he was now in British Columbia. This minister came to see me yesterday and brought his wife. In the minister's mouth I found a lower bridge, a very nice denture, put in by Richmond many years ago. In examining his wife's mouth, I found she had a right upper bridge anchored on the third molar with a gold band around the second bicuspid, and she said that bridge had been doing good service for twelve years. Here we have an eighteen-year bridge in one mouth and a twelve-year bridge in another, and yet there are hundreds of dentists who have never put a bridge in a human mouth.

Another incident I wish to speak of is a case I had to-day. On referring to my books to see when I had inserted a certain filling, I said to the lady, "You seem to have had five lower incisors, according to my accounts." She replied, "I have always had five incisors, and," she said, "my husband has five incisors, too." I had forgotten that, not having filled his teeth for twenty years. It is very strange to find people with five inferior incisors, and the coincidence in the cases described is truly remarkable.

Dr. WM. CARR. I have the pleasure of presenting to this society, on behalf of Dr. Bödecker, a copy of his new work on "Anatomy and Pathology of the Teeth." I move that the secretary be instructed to acknowledge the receipt of the same, with thanks.

Motion unanimously carried.

Dr. SIDNEY S. STOWELL, of Pittsfield, Mass., then read a paper entitled "Local Exercise and Dietetic Exercise upon the Teeth."* Dr. Stowell showed two models, which he referred to in his paper.

### *Discussion.*

Dr. JARVIE. This is an exceedingly interesting paper, and a paper of this kind is very good for us to listen to from time to time. It brings to our attention the necessity of proper diet and physical exercise. The teeth of course are part of the physical economy, and anything that will improve and strengthen the physique will naturally tend to improve the condition of the teeth. It is a mistake to suppose that the present generation is degenerating physically. I think the people of the present generation are better physically than those of several generations back. The young men and middle-aged men of this country are beginning to take as much exercise perhaps as those of any country in the world. Go out into the vacant lots about this city to-day, and you will find them occupied by a lot of street gamins or school-boys. Our college young men are at foot-ball and base-ball, or at the oar, and to-day the young men of our country will compare favorably with the athletes of other countries. We read of the young men of Rome and of Athens in the arena. Perhaps a thousand years hence people will read of our young men in the arena as we see them any Thanksgiving day, when twenty-two of as fine young men as can be found anywhere in the world are pitted eleven against eleven. If there is anything running mad at the present time it is out-door sports and athletics, from foot-ball to the bicycle. All this is tending to develop the physique of the present generation, and will be reflected upon the coming ones, and even now I believe that dentally the present generation is far superior to that of the past. Look among any gallery of portraits of the people of fifty, seventy-five, or one hundred years ago, and in the old people represented there you will generally find the chin and the nose meeting. We do not see such old people to-day,—in some cases, I grant, on account of artificial teeth, but mostly because the teeth are kept longer in the mouth, and that is partly due to our increased skill in treating pyorrhea alveolaris. A generation or two ago people of fifty years of age had their teeth loosen and drop out, and to-day, if people were not cared for by the forty thousand members of our profession, their teeth would drop out too. The present generation does not live altogether on fine wheat and flour. There is hardly a family represented in this room that does not have on its table every morning the oatmeal and wheaten grits and cracked wheat which supply the necessary elements to make tooth-structure. It is a mistake to decry our present mode of living as having degenerated from what it was years ago. We do not often see the fine teeth that are seen in the skulls which are dug up of those who lived in past ages; but yet among those skulls we find that men who lived one thousand or two thousand years ago had all the diseases that are incident to the teeth to-day. But those skulls represent the survival of the fittest. In the time these savages lived, the delicate, the weak, were not able to survive the hardships. They died or were killed, so that only the hardiest and the strongest were allowed to live. We are largely indebted to the great progress that the science of medicine has made for the number of weakly, delicate, and sickly people who are living among us to-day. If it were not for the advance of science in medicine those people would have died years ago, and the unfortunate part of it is that such people are apt to propagate their kind. What would have been true of this country, in regard to exercise and out-door sports, or the lack of attention to the laws of hygiene a few years ago, is not true to-day.

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* For Dr. Stowell's paper, see page 46 of the current number.

Dr. W. IRVING THAYER. If your essayist made one point plain to-night, it was this: that local, not general, exercise is necessary,—exercise that is performed in the immediate vicinity of the teeth,—not that it was necessary to go into the field and play ball. Two points I understood from the paper, and they are these: proper exercise of the teeth, and proper pabulum for the stomach and the teeth. While I agree with him in regard to the exercise of the teeth, I do not think he made plain the kind of food that should be eaten. Teeth are made up of soft solids and calcareous salts. Teeth built up once are built for always, and it is when they are being built up that they should have a sufficient quantity of calcareous salts to fill in with the soft solids, in order to make the teeth dense. Our cereal grains are rich in phosphate of lime. The Almighty, in His wisdom, has put it in such shape that we can digest it, and appropriate it as we need it. The pabulum that is necessary to build up this tissue can be found easily, but if you deprive the bony structure of the teeth of the pabulum they require, the teeth will be weak. Take a dog and feed him on the fine flour that our friend spoke of, and you cannot keep him alive thirty days; change that food to the whole wheat, and you can keep him indefinitely, showing that the system requires this phosphate of lime, and by supplying a sufficient quantity of it you can build teeth dense. The assumptions of the essayist are true to the letter. It requires the local, not the general, exercise of the teeth, and the right kind of pabulum to finish and build them up.

Dr. STOWELL. It was my intention in mentioning the benefits derived from general exercise, as an illustration, to accentuate the value of local exercise of the teeth in masticating food. I might refer again to those children, three and five years of age, whose teeth were decayed to the gum-margin. They were as fat and plump and pretty and jolly and good-natured children as I ever saw. Their photographs would make first-class advertisements for Mellin's Food and malted milk. They were taking the lime into the system, and their systems showed it. The teeth had deteriorated because they had never been used.

Dr. C. G. PEASE. The essayist refers to the children who were brought up on Mellin's Food. Those foods are carbonaceous ; they supply heat and fat, but they do not supply the lime-salts ; and children fed on those foods are liable to develop rickets.

Dr. THAYER. There is one notable exception to that. There is a food that is made here which is rich in calcareous salts.

Dr. PEASE. I understand the malted milk has it.

Dr. THAYER. Yes, but in a very limited degree.

Dr. B. F. LUCKEY. It has given me much pleasure to listen to Dr. Stowell, and while I agree very largely with what he has given us in his essay, I feel as I have always felt, that good teeth (like good bodies and good brains) are very largely a matter of inheritance. Given good teeth to begin with, with moderate cleanliness and care that person is very apt to finish life with good teeth. I have seen many examples of contracted disease after, say, the twentieth year of life, and even cases of pulmonary troubles, where men who reached the age of forty or fifty years with perfect wrecks of bodies had magnificent dentures. Again, we have seen children strong, well made, and with well-developed bodies, who have soft, almost worthless teeth. We see those examples in one family sometimes. I had, within a short time, a visit from a woman born in one of the European countries, an example of inherited physical perfection. Mentally she was deficient,—I do not mean in the sense of idiocy, but simply lacking in the sense of development of the mental faculties. Her body was as perfect, as far as we can judge outwardly, as that of any person I ever saw. Her teeth were absolutely perfect, guiltless of any stain or tartar ; and yet she stated that she had *never* cleaned her teeth with *anything*. Her object in coming to me was to bring her daughter, a little child of eight years, who had broken a tooth by a fall. I said to her, "If you want her to keep her teeth, she must clean them." The teeth of the child looked hard, but there was present that green-stain that we often see in soft teeth. It was then that the mother told me about her own teeth. While Dr. Stowell was reading his paper, the question came to my mind whether the deterioration that appeared in that child's mouth was due entirely to neglect, or whether it was not possible that it was owing to her having been reared differently in our nineteenth-century civilization here in this country, as distinguished from the bringing up of the mother in the old country. It was probable that the mother lived nearer the way in which God meant all human beings to live, nearer the animal mode of living, and this child, under the more prosperous circumstances of her mother, was receiving not only the bare necessities of life, but a good many of the luxuries and comforts, and probably the softest of foods. Even potatoes for children nowadays have to be mashed, and the teeth, as Dr. Stowell has shown, are used simply to perform a function of beauty and articulation. They are not for use as masticators or as grinders, and probably that may account for the inferior quality of this child's teeth as distinguished from her mother's. It may have been due to the marriage of her mother with a man who had inferior teeth, or it may have come from some other branch of the family, as we know is possible. I reiterate, that with an inherited denture of moderate strength and ordinary cleanliness on the part of patients, the probability is that they will go through life with a fairly good denture.

Dr. STOWELL. How about the man with the two sisters?

Dr. LUCKEY. That might be in accordance with the theory that was once prevalent, that the syrup of lacto-phosphate of lime was the proper thing to give children. I once heard of a case where the children of a certain family had soft teeth that decayed early. The family physician took the mother in hand some time previous to the birth of one of her later children, and put her on a treatment of the syrup of lacto-phosphate of lime. That child, when it reached the age of fourteen years, was able to present a mouth with beautiful, hard teeth. I should think that was parallel with the case you cite here. It has been proven, time and time again, that the syrup of lacto-phosphate of lime does not harden the teeth, and it had nothing to do with the facts of those cases, but it got the credit. How does it happen that in some families one child is a perfect Apollo, and the other a perfect Abortion?

Dr. S. G. PERRY. My views were expressed for the most part by Dr. Jarvie, and supplemented by Dr. Luckey's remarks. I think that the inherited influence is one of the most important factors of these cases. I do not quite agree with the gentleman in reference to the deterioration of the race in the present day. I think with Dr. Jarvie that the people we see at the present time are even improved on those we would have seen had we lived one or two hundred years ago. I see in my office sometimes people whom I consider perfect specimens of physical development. I think Dr. Jarvie has made a very good remark in saying that it is the survival of the fittest. I think it is generally accepted that the older races of men were subjected to the diseases that we have, perhaps not to the same degree. Dr. Jarvie speaks of the exercise that has been indulged in by the young men of the present day. He did not speak of the exercises indulged in by the young women. There never was a time in the history of the world when young women and young men took as much out-door exercise as they do now. The bicycle is of great benefit to both sexes. The English women live in the open air, as we all know, and take a great deal of exercise, as do the Scotch people, who also live on simple diet. I think the main points in the paper are sound and correct. I am not quite prepared to accept his ideas in reference to the use of bolted wheat bread, simply for the reason that it is not as generally used as it was formerly. The Health Food Company is supplying an immense number of families with bread made from what is called the whole wheat flour, which is a great improvement on the brown bread that was formerly used. Those insoluble microscopic spiculæ which pass through the system without having any effect, except to irritate the intestines, are eliminated, and the convertible portion is retained. In reference to the habit of eating meat, I think that is carried too far. Thompson, of London, who is probably the greatest authority on the subject of diet and foods, takes the ground that we all eat too much,—that is, those of us who live indoors a great deal. Dr. Fothergill, who died several years ago, and cut short a career of immense promise, in his little book, "The Town Dweller," took the strong ground that meat-eating was the source of innumerable evils, particularly causing the excess of uric acid in the blood. He set his face against the use of meat as a common article of diet for those who live indoors. Another prominent physician, Alexander Haig, of London, takes the same view. He has a level head, however, and does not exclude from the use of meat people who live out of doors a great deal and who exercise a great deal. There is no doubt in my mind that people who live indoors should be very sparing as far as eating meat is concerned, and their diet should be more made up of milk, eggs, and albuminous substances. It all comes, after all, to the subject of moderation in diet,—a moderate amount of meat for those who live indoors, the use of cereals in reasonable quantity, and the use of cooked fruits.

Dr. OSCAR ADELBERG. Dr. Perry, in his enumeration of exercises, failed to mention one which is indulged in by the feminine sex, and comes under the head of local exercise,—that of chewing gum. Apropos of the dietary influence upon children's teeth, I wish to say that in my own family I have two children, one a girl of five and the other a boy of three. Both were brought up on the bottle, the older one being fed on cow's milk and Ridge's Food, the other on condensed milk and Ridge's Food. The little girl has as perfect a denture as you can find. The little boy has three incisors wasting away, a condition which we so frequently see in children. From the time they were babies they did not get anything else to chew on between meals except German pretzels, which are pretty hard chewing and good exercise. They flourished on them. The only way I can account for the difference in their teeth is the use of condensed milk in the one case as I have related.

Dr. THAYER. I know a person who was brought up exclusively on condensed milk until he was nearly two years old. The calcareous salts of the cow are greater than those of the human species. When he began to eat, he had for his bread food bread that was made of the whole wheat, and for his pap food well-cooked oats. He has as perfect a set of teeth to-day as you can find anywhere. He had the local exercise. He did not have the exercise of horseback and playing ball, but it was a local exercise, and he had the proper calcareous salts, and the result is a perfect set of teeth to-day at thirty-seven years of age.

Dr. S. FREEMAN. I find in my practice that quite a number of the children who are fed on condensed milk have their deciduous teeth eaten away, but it has no effect on the permanent set of teeth.

Dr. STOWELL. I would still emphasize with all the strength that I can give, that upon local exercise alone depends the salvation of the human teeth of the future. We may even do away with the bugbear of the past, which we have always held up before our patients, in regard to the use of candies, if they will eat an ample amount of coarse, hard food which requires mastication.

A vote of thanks was extended to Dr. Stowell for his interesting paper.

Adjourned. B. C. Nash, *Secretary.*

## ACADEMY OF STOMATOLOGY.

Meeting held December 10, 1894.

### *Discussion of Dr. Truman's Paper.**

Dr. Kirk. I am exceedingly gratified that Dr. Truman has investigated this subject so minutely. It is one in which I have been very much interested for some time.

In respect to coagulants, my own research was simply to decide the question whether they were self-limiting, or set up self-limited barriers to their further penetration, and I demonstrated to my own entire satisfaction that they were not self-limiting.

The phase of the matter which Dr. Truman has presented here tonight is one which I can hardly discuss. It will need a careful study of the paper, involving as it does the question of the relative diffusibility of these substances, before it can be discussed intelligently.

There is a matter that I think Dr. Truman thoroughly recognizes, but it should be noted here, and that is, that the diffusibility of a coagulant substance may be varied by differences in the strength of its solution, as by using different dilutions we get different effects; differences in density of coagulation and different rates of diffusion.

As to these two teeth respecting which Dr. Truman has asked my opinion, in one the inlet tube seems to be stopped up. I should say that the failure in this case to get the effect of the chlorid of zinc through the cemental wall was due to a stop or break in the continuity of the column of zinc chlorid solution. The tube appears to be plugged up with something or other.

I spent a great deal of time before I could get a perfectly solid column of liquid between the pulp-chamber and the inlet tube in the experiment of which this is the duplicate. I found, I suppose, in a half-dozen cases, or maybe more, perhaps ten cases, in arranging the inlet tube in contact with the tooth, that I had great difficulty in getting a continuous column of liquid.

I know that the teeth Dr. Truman examined in my laboratory afforded, to my mind, conclusive proof that the zinc chlorid had penetrated the cemental wall.

Dr. Truman. So I thought at the time.

Dr. Kirk. As to its being a question of a crack at the bifurcation of the root, I remember in one of my experiments coagulation took place at the root bifurcation, and I attributed that not to the supposition that there was an anatomical break here, but to the fact that the structure was thinner at that point, and the zinc chlorid solution following the shortest course, coagulation was started at that point. In the other cases it did not tend to start at the apex of the root, but near to the juncture of the enamel-cap with the cementum. That is where coagulation occurred in the case that I reported as successful, which I exhibited in New York. Unless it was a break in the tooth-structure, it must have penetrated through the cemental wall, in my judgment.

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* For the paper in full, see page 33 of the current number.

I am quite interested to hear the views of Dr. Harlan on the subject. It is a very fortunate coincidence that he is with us this evening. We have been hearing so much on this one side of the question that I am sure it will be gratifying to all of us to hear the other side of the case stated.

Dr. A. W. Harlan, Chicago. Mr. President and gentlemen, it is a very happy accident that brought me here this evening. I was entirely unaware that the subject was to be discussed, and I did not know that a paper was to be presented. I did not come forward at this time to state the other side of the question, because I am going to state that in New York, at the January meeting of the First District Dental Society, but am going to make two or three queries which may have some bearing on this matter.

The first one is this: If zinc chlorid is such a powerful penetrating agent, why is it that it does not preserve the portion of the pulp that is dead and left in a root that has been treated with zinc chlorid and afterward had a root-filling placed over it?

If carbolic acid is such a powerful penetrating agent in the apical portions of a dead pulp, why is it that an abscess inevitably follows after an incomplete root-filling, when that portion of the pulp has been thoroughly soaked and saturated, as far as it may be, with carbolic acid? If creasote, which is practically (or partially) soluble in water, is applied for weeks and months to these stump ends of dead pulps, and afterward a root-filling is introduced, whether it is metal or oxychlorid of zinc, or gutta-percha, or any other agent that will not force the portions of the dead pulp through the root, why is it we subsequently have an abscess, if these agents are antiseptic agents as well as coagulating agents? Mr. President, it seems to me this is one of the questions that ought to be settled. I deny (without giving my reasons now) that zinc chlorid or carbolic acid, or creasote or bichlorid of mercury,—these are the four agents, I think, that have been mentioned here,—are powerful penetrators of albuminous matter in living teeth.

I will give the reasons at the First District Dental Society of New York.

Again, the handling of pulpless teeth successfully by the men in this room has been largely brought about by the agitation of the question of the use of coagulating agents. Well, perhaps I am one of the guilty ones. I spent a great deal of time on it. I read the first paper on the subject in October, 1881, in Cincinnati; and from that time to this I have been engaged with matters in this connection.

I do not expect any one to answer the queries I have presented here to-night, because there is no man in the room who does not know that it is true that abscess almost invariably follows after the treatment of stump ends of dead pulps of teeth that are left there, and when the whole pulp has been soaked for weeks and months with creasote, and the tooth has afterward been filled. Unless some change has taken place that will produce an encystment of the apex of the tooth, there will be an alveolar abscess there,—blind or with a fistula.

One of the reasons why a coagulating agent is not a fit substance to use in pulpless teeth is that a coagulated body is the fittest food for micro-organisms. Dr. Truman smiles. Ernest Laplace, of Philadelphia, I believe, is one of the authorities for that statement. W. D. Miller is also another authority. Hueppe is another. Koch is another. I do not need to mention others, to the effect that a coagulated body is the fittest food for micro-organisms.

Dr. J. Y. CRAWFORD, Nashville, Tenn. I have been very much entertained with the paper, as well as very much interested in the discussion. I would not presume to interject any crude and unprepared remarks. I have some views, it is true, but for fear they might mar the scientific trend of thought thus far expressed, I would prefer not to make them known.

Dr. GORDON WHITE, Nashville. I am entirely undecided on these subjects. I have made some little investigation, but nothing that has proven entirely satisfactory to my mind, as to which is the best agent to use. I find that in root-canals perfectly filled I have very little trouble with them afterward.

I am, indeed, very glad to have this opportunity of listening to the paper and hearing the discussion from the gentlemen who have preceded me.

Dr. C. R. BUTLER, Cleveland, O. I am as several others have expressed themselves, unable to go into this discussion with any degree of intelligence. It has been presented in an altogether different manner from anything I have ever heard before. It seems to be based upon thorough investigation, and is, to a very large extent, original. It is a question that has been perplexing practitioners all along. It seems as though this all-important question of the treatment of pulp-canals or pulpless teeth was about to be settled, so that we would have some intelligent line of practice and mode of handling them, so that we would not be all at sea.

Dr. C. S. BUTLER, Buffalo, N. Y. I learned a week or ten days ago that Dr. Truman would present a paper upon this subject to-night, and I thought I must, if possible, get to Philadelphia and hear the paper, which, to my mind, is the clearest presentation of that phase of the subject I have ever heard. I look forward now to the time when I can study it at my leisure and get a better comprehension of it.

Dr. M. L. RHEIN, New York, expressed his pleasure at having had the opportunity of hearing the paper, and believed, with the others, that it was a paper which required careful study at leisure, to enable one to determine the exact value which it unquestionably possesses. He thought, with one or two of the preceding speakers, that the points under consideration were nearer solution than they had ever been before in the history of our profession.

Dr. CHAS. J. ESSIG. Mr. President and gentlemen, I did not intend to enter into the discussion, but I have been listening with a great deal of pleasure to Dr. Truman's paper. It occurred to me that the sense of the paper was not so much as to the value of certain agents in root-filling or in the treatment of roots, as it was of the relative penetrating power of certain agents. And while I think his paper was a very valuable one and a very thoughtful one and a very good one in every respect, still I conceive that in order to determine a question of that kind it would be necessary to take up a series of the most careful experiments ; and the nearer we could come to the condition of the mouth, the better able we would be to demonstrate the penetrating power of certain agents.

It would be necessary, it seems to me, to take pulpless teeth and fill the roots with an agent and subject them to the temperature of the mouth for a certain length of time, and then make microscopic sections of the tooth and examine them under high power, to determine the penetrating power of certain agents.

I do not understand Dr. Truman's paper as condemning coagulants in the treatment of pulpless teeth. As I understand it, the point of his paper was what the relative penetrating power of certain agents would be.

I should imagine that such a matter could be very accurately determined by a series of experiments with microscopic sections, but I cannot see how we can arrive at anything by a few experiments with glass capillary tubes, considering that they present different conditions entirely from those we meet in the mouth or teeth ; and while it is of a great deal of value to observe these subjects even in the light in which they are here presented, it would be better still to first demonstrate beyond a doubt by very correct experiments, such as I have alluded to, that could be done if we could find the time and the enthusiasm, after the day's labor, to prosecute such work. It would be very difficult, as all such experiments are.

Now, while the specimens were going around, I could not help thinking of the experiments we used to make with amalgams, of filling glass tubes and then subjecting them to certain theoretical tests, and it was not until we brought them as near to the conditions of the mouth as possible that we began to learn something. When the experimental test fillings were subjected to the fluids of the mouth, at the temperature of the mouth, we found they behaved almost the same as they did in the mouth.

Dr. A. H. PORTER. I believe that in pathological treatment the more nearly it is identical with normal physiological action the more it is to be desired. In the formation of the tooth-substance from the blood-plasma nature has a certain purpose to effect. In any cell-proliferation where a dense, hard structure is to be produced, as in the odontoblastic formation, we have virtually a natural coagulation.

The main factor to be considered in an organ exposed to the impact of an external environment is its resistance to pressure. According to the strength and duration of this resistance are the vasomotor mechanism called into play and the metabolic and circulatory activities regulated.

In the case of the visual and aural apparatus, these activities are at a maximum on account of the rapid, oscillating character of the ethereal and aërial environment forming light and sound.

In the case of tooth-structure, however, nature opposes a mechanical strain of comparatively long duration.

This permanent force is met by the permanent structure of enamel and dermal appendages generally where the circulatory activities are at a minimum.

The artificial coagulation demonstrated by the essayist approaches this condition, and is to be valued for its experimental character.

Dr. KIRK. One point has occurred to me since Dr. Harlan spoke, and it seems to me his queries ought not to go by without some further consideration.

I believe it is undoubtedly true that coagulants form a suitable pabulum for the growth of certain micro-organisms; but what coagulants? Under what conditions? In an editorial in the DENTAL COSMOS, perhaps two years ago, I called attention to this same point, and it seems to me very important that when a coagulum is formed with any substance capable of producing coagulation when brought in contact with albumen or gelatin, we should recognize that we are producing a chemical compound by chemical reaction, and that it is a reaction which follows the law of all chemical combinations,—viz, it takes place in definite proportions by weight, that is, the relationship between the amount of coagulant required and the amount of albumen required to produce coagulation is exact and definite.

Now, if you produce a coagulum in an excess of albumen, you produce a compound which has no resulting excess of the coagulant. With, for example, zinc chlorid, or bichlorid of mercury, you can produce a coagulum that has no excess of the original zinc or mercury salt. Having the albumen in excess, all of the zinc chlorid or sublimate has been used up in forming the coagulum, the compound is exactly balanced, and you thus have no doubt a coagulum which very likely is, as it has in fact been demonstrated to be, a suitable pabulum for certain kinds of micro-organisms to grow upon. After you have formed your coagulum, however, if you provide an excess of the coagulant antiseptic, then you must certainly render the coagulum antiseptic, exactly the same as you would any other substance or tissue under the same circumstances. The bichlorid of mercury or zinc chlorid then being free to act, the question resolves itself into one of how long will this excess of antiseptic material remain active, and what is its antiseptic value.

Neutral coagula, in which there is no excess of the antiseptic which was used to form the coagulum, probably have little or no antiseptic value. Therefore, if you wish to get an antiseptic condition of a coagulum, you will have to use an excess of the coagulating substance.

The statement that Dr. Harlan made seemed to me to need that much qualification at least, to give us the right view of it. I hope the discussion of the subject will go on until we do know something more definitely about the proper position of these agents in the treatment of root-canals.

Dr. JAMES TRUMAN. I had intended answering Dr. Harlan in the manner so ably illustrated by Dr. Kirk. We sometimes bow to authority without proper examination.

I have never been able to make cultures on the class of coagulants described by Dr. Kirk, and I do not regard it as possible within a reasonable period. Again, I do not believe in Dr. Harlan's assertion in regard to the coagulating process, as he terms it, on the stumps of pulps. I do not believe that inevitably alveolar abscess follows that sort of treatment. On the other hand, I am very well satisfied that it does not follow it. That is simply dogmatism ; so is the other.

In answer to Dr. Essig's remark, "That this is not a carefully prepared paper—"

Dr. Essig. No, not that ; but that it didn't go far enough.

Dr. Truman. I admit that the paper is not exhaustive, but the experiments were ; and if they are not, I don't know how they can be made so. I have spent three months on these, and have repeated them over and over again. It is true others may have been able to have conducted them more successfully. I cannot conceive how it would be possible to make any essential difference by keeping the tubes at the temperature of the mouth. He asserts there was not sufficient care in microscopic experiments.

Dr. Essig. I beg your pardon, I have not seen any microscopic specimens at all.

Dr. Truman. My feeling was that the sections prepared in the course of these examinations would not be understood by all present. It was my ambition and desire to carry the stain with the coagulation into the tubes of the dentine, but I could not accomplish it. The coagulation would invariably leave the stain. All the stains with which I was familiar were tried, and I then consulted with the histologist of the department of medicine, University of Pennsylvania, but with no satisfactory result. Nitrate of silver will penetrate the tubuli without difficulty, but the stain is deep and so thorough as to render it almost valueless for observation. I have specimens at home and will be pleased to show them, but I did not think it worth while to bring them here to-night.

I have spent a large portion of my life in some forms of histological work, and I should know something about it ; at all events, I do know how to differentiate normal tubes from those which contain coagulum. The whole character of the protoplasm contents is changed, and the tubes are so nearly obliterated that it becomes a matter of difficulty to trace the outlines of the original walls. My greatest desire is that this question should be settled, and I have tried to do something toward this end, and must believe that the work shown to-night carries it nearer a solution.

The subject was then passed.

## Casual Communications and Incidents of Office Practice.

Dr. Guilford. We are now on the eve of commemorating the discovery of anesthesia, and it seems to me that we should not lose sight of the fact that there is always some danger connected with the anesthetic state. We know it very well, and we should not lose sight of that fact. It so happens that during last week some of our visitors, who came from Buffalo, brought with them an apparatus for producing forced respiration in cases of asphyxia, and exhibited it at one of the dental colleges in this city last Saturday. It excited so much interest that I took the liberty of asking Dr. Butler to exhibit it here to-night.

Dr. C. S. Butler. It is only because I feel the importance of it to our profession, and perhaps because it may be new to some of you, that I have consented to present this matter before you. It is simply an apparatus for use in cases where asphyxia has followed the administration of anesthetics. It sometimes occurs notwithstanding all our methods of artificial respiration that we are unable to resuscitate the patient, or, rather, re-establish normal and natural respiration, and consequently the patient dies. It has been the opinion of the medical profession, on the other hand, that forced respiration should never be resorted to. Even as late as 1892, Dr. Marshall Hall, the celebrated English physician, stated in his "Hand-Book of Ready Reference," in cases of asphyxia that forced respiration and the bellows should never be used. Three cases have come under my personal observation which have satisfied me that the danger of forced respiration is entirely misconceived. It has been conclusively shown that it may be applied and the patient brought back to life again.

I will cite two cases of nitrous-oxid asphyxia with which I am very familiar,—one where the patient died, the other where the patient was saved. The first was that of a married lady below middle life, who came to a dentist in the city where I reside and had nitrous oxid administered for the purpose of having a tooth extracted. She had taken the gas successfully on other occasions, but on this occasion, after the operation, it was observed that the patient had ceased to breathe. A messenger was dispatched for a physician, and two physicians who lived near by came in a few moments and made efforts to resuscitate the patient, or to re-establish respiration, but without result, although the patient's heart continued to beat regularly and strongly for fifty-five minutes.

The other case occurred last July in Buffalo. A lady, a trained nurse,—I mention that fact, to show that she was of more than the average intelligence in regard to medical matters,—applied to one of my brother dentists for the administration of nitrous oxid for the extraction of a tooth. The nitrous oxid was given perhaps to the amount of six gallons, and the tooth was extracted ; no unusual condition being apparent during that time. For a moment or two after the tooth was extracted my friend noticed that she was not breathing. He endeavored to re-establish respiration by methods he had used on previous occasions, by opening the waist-bands and loosening the corsets, and telescoping the short ribs suddenly, by placing his left arm beneath the patient's right arm, reaching over and letting go quickly. This failed of the desired result. He then dispatched his assistant for me, and also at the same time to the nearest telephone to call the hospital ambulance, and with the request that they bring their forced-respiration apparatus. I hastened at once to the patient with my friend Dr. Low, who was in the same building, and for about twenty minutes, or until the arrival of the ambulance, we worked by placing her on the floor, with shoulders elevated, by the Sylvester method of artificial respiration. It was probably twenty-five or possibly thirty minutes before the arrival of the hospital surgeon and the apparatus for forced respiration was applied. In possibly twenty-five or thirty minutes after the forced respiration had been commenced the patient was able to be moved to the hospital, and two hours after arriving at the hospital she was able to go about her usual duties. Now, there is not the slightest doubt in my mind that without the forced-respiration apparatus she would never again have breathed normally, and would have died. Indeed, she came near dying after the surgeons arrived, her heart having nearly ceased to beat.

Another case of narcotic asphyxia from narcotic poisoning probably illustrates the value of the apparatus better than any other. It was the case of a young physician recently graduated, and who had just entered upon his professional career. Through an unusual number of coincidences he had been deprived of the normal quantity of rest and sleep for a period of five days and nights, and in order to sustain himself and continue his duties he had begun the taking of strychnin as a stimulant, to brace him up. On arriving at his office, about half-past one at night, he went into the bath-room and injected into his arm one-fortieth of a grain of strychnin ; feeling no effect, two or three minutes afterward he injected two-fortieths, and in a moment later another fortieth. Beginning to feel some tremor, but having no apprehension of danger, to counteract it he began to use morphin hypodermically. This he continued as long as he was conscious. He was found in this condition at seven o'clock in the morning, in the bath-room, by his father. Physicians were sent for at once, and at half-past a physician arrived with the forced-respiration apparatus. It was immediately seen that the case was a serious one, and they performed tracheotomy in order to facilitate enforced respiration, and for three days and nights continuously, with cessations a few moments at a time, the physicians and nurses continued to breathe for their young physician. During the seventy-two hours there was probably not more than fifteen minutes in which the patient was physically able to breathe by himself, although after a few hours on the third day he was thoroughly conscious of all that was being done for him, and after a few hours spoke in a low whisper, but was still unable to breathe by himself. At the end of the seventy-two hours he was able to breathe quite comfortably, and very soon regained normal vigor, and in a few days went about his professional duties.

These three cases, it seems to me, establish very clearly the false position in which the medical world has held forced respiration. Since gentlemen in our city began to use the forced-respiration method, there have been saved by it over fifty persons, who, humanly speaking, without forced respiration would have died.

A demonstration of the apparatus and its method of use was then given by the speaker.

Dr. KIRK, on behalf of Dr. Essig, presented to the museum some specimens of abnormal teeth, consisting of two pairs of teeth with roots fused together. A specimen also of an upper cuspid having two roots ; another, a pathological specimen, of which there is no description.

Also a preparation of lithium bitartrate sent from London. Dr. Kirk said in regard to it : I wrote a communication some time ago on the lithium bitartrate as a remedy in lithemia, and especially the cases of lithemia which result in certain forms of pyorrhea alveolaris. The preparation is made by Alfred Bishop, of London, in the granular effervescent form. It was suggested to him by reading the paper to which I have referred, published in the *Lancet*. I suspect, although I do not know, that it contains something besides lithium bitartrate. It is marked as containing five grains of lithium bitartrate to a dram of the powder or granules, and I presume that the remaining fifty-five grains of the material is possibly bicarbonate of sodium or potassium, to bring about the effervescent quality.

I have another preparation here made by McKesson & Robbins, of New York, which they call tartarlithine. It contains nothing in the shape of other alkaline salts, and is effervescent. It has added to it a small amount of saccharin to modify the sharp acid taste. This preparation is the one I have been using most successfully in my own work.

If there are any gentlemen present sufficiently interested to observe cases under treatment of this particular lithium salt,—and I find it has a value considerably above any of the lithium preparations I have ever tested,—I will be very glad to furnish him with the necessary material to do it.

Dr. DEANE. We have from time to time in our Philadelphia society heard of English teeth and of their fine texture. We have in the Pennsylvania College a young Englishman, who brought some of Ash's teeth with him and asked permission to put them on a plate and bridge-work. I borrowed the specimen to show it to the members of the society this evening. It may prove to be interesting to some. The teeth are set on a pin and cemented by melted sulfur. He has left the first bicuspid loose so it can be taken off. They seem to be as fine in the inner portion where the tooth is ground out as they are on the surfaces. He tells me they have no trouble from splitting or breaking when they are fastened on the plate by the sulfur. The bridge is made of German silver, and represents the ordinary college work of the junior year.

Adjourned.

GEORGE D. B. DARBY, *Secretary.*

## THE SEMI-CENTENNIAL OF MODERN ANESTHESIA.

THE action of the American Dental Association at Old Point Comfort in August last (see DENTAL COSMOS, September, 1894, page 702), looking to the celebration of the fiftieth anniversary of the discovery of modern anesthesia by Horace Wells, of Hartford, Conn., culminated in Philadelphia, December 11, 1894. A notable gathering of representative dentists assembled to do honor to the man who gave to mankind what one of the speakers called the "most beneficent discovery the world has ever beheld."

The exercises, which were held under the auspices of the American Dental Association, consisted of the reading of papers and addresses at an afternoon session held in Association Hall, and a banquet at the Union League in the evening, at which many brilliant speeches commemorative of the occasion were made.

Promptly at 2 o'clock P.M., Dr. J. D. THOMAS, chairman of the committee having the celebration in charge, stepped to the front of the stage and called the large audience to order, and after making a brief announcement of the banquet to be held in the evening, introduced Dr. J. Y. Crawford, president of the American Dental Association, as chairman.

Dr. CRAWFORD, in assuming the chair, made a short address, reciting the action of the association providing for the celebration and appointing the committees to take charge of the exercises. In pursuance of that resolution, and by direction of the association, he appeared to inaugurate the celebration of the fiftieth anniversary of the discovery of anesthesia. It was not necessary to enlarge upon the reasons for this gathering. It was enough for the dental profession to know that fifty years ago to-day the whole human race in the ages to come was benefited by the first legitimate exhibition of surgical anesthesia, and that to a dentist should be accorded the honor of its discovery.

Dr. THOMAS FILLEBROWN, of Boston, then read a paper entitled "History of the Discovery of Modern Anesthesia." Dr. Fillebrown said that fifty years ago to-day there was enacted in the city of Hartford the first scene in the grandest and most beneficent discovery the world has ever beheld,—the discovery of modern anesthesia. To pay our tribute to the memory of the discoverer of this great fact, let us examine the testimony, restate the facts, and again judge their relative value.

Referring to the search of the ancients for an agent to produce insensibility to pain, the essayist spoke of the use of mandragora and preparations of hemp, etc. Protoxid of nitrogen was discovered by Priestley, described by Davy, and practically applied by Horace Wells in 1844. Sulfuric ether was discovered in the thirteenth century, described in the sixteenth, and practically applied in 1846 by Morton.

For four years previous to his demonstration, Horace Wells had believed it possible to produce by the inhalation of certain gases, especially nitrous oxid, a degree of intoxication that would obtund the pain of surgical operations. The well-known incident of the 11th of December, 1844, when Horace Wells expressed his belief that a tooth could be extracted under the influence of nitrous oxid, and proved his theory by submitting to the operation, was rehearsed in detail. Then were the deduction and suggestion made by Humphry Davy in 1800 verified by Horace Wells, and practical anesthesia became a discovered and demonstrated reality. This event was the source of the world's knowledge of anesthesia; though even those most interested, most acute, and most observant did not apprehend the great fact that surgical anesthesia was a possibility.

In future years, whenever and wherever the discovery of anesthesia is intelligently discussed with knowledge of the subject, the name of Horace Wells will be spoken with honor and gratitude, and with it will be associated the names of John M. Riggs, G. Q. Colton, E. E. Marcy, W. T. G. Morton, James Y. Simpson, Charles F. Jackson, Oliver Wendell Holmes, and Henry J. Bigelow, of whom Drs. Marcy and Colton still survive. Colton administered the nitrous oxid to Dr. Wells at the first operation under anesthesia, wherein Wells's tooth was extracted by Dr. Riggs, and reintroduced its use in 1863. Dr. Morton made the first public application of ether for surgical anesthesia. Jackson claimed to have suggested all that Morton knew about ether. Simpson discovered the anesthetic power of chloroform. Holmes suggested the name anesthesia in a letter which the paper quoted.

The claims made in behalf of Dr. Crawford W. Long, because he had used ether for anesthetic purposes three times during 1842 and 1843, were negatived by the fact that his connection was not mentioned till years afterward. As Dr. R. M. Hodges said, "Not a physician or surgeon ever used ether because Long had used it; nor did mankind learn from him that anesthetic inhalation for surgical purposes was possible."

Dr. Bigelow's connection with the ether discovery was important. He practically supervised etherization during the first year of its use; made a clinical study of the subject, and announced the discovery in a paper read at the American Academy of Medicine, November 3, 1846. He verified the anesthetic power of nitrous oxid in 1848. Had he been present on the occasion of Wells's first experiment, it is not unlikely the course of events would have been different. Dr. Marcy suggested to Wells the use of ether instead of gas, and verified its action.

At that time some denied that nitrous oxid was an anesthetic; to-day it is known as one of the most efficient. In 1844 Wells claimed that the gas was safer than ether; others denied its safety. To-day it stands proven the safest and most pleasant anesthetic known to the world. It was then claimed to be impracticable to use it. Now it is successfully administered annually to more patients than all other anesthetic agents combined. It was then claimed to be inefficient for prolonged operations. To-day it is proven equal to prolonging the anesthetic state indefinitely. Then it was contended by skillful surgeons and eminent divines that "pain was a natural protection, a necessary stimulant to the reparative process, and a providential dispensation, and that the prevention of it was defying the Almighty." Now it amounts to inhumanity and malpractice to presume to do any severe operation without anesthesia.

The facts established by indisputable sworn testimony are:

"That in 1840 Dr. Wells expressed his faith in the anesthetic power of nitrous oxid; that on December 11, 1844, Wells inhaled nitrous oxid and had a tooth extracted painlessly, which became known at once throughout the vicinity of Hartford; that he forthwith went to Boston, and through Morton, who had been a pupil of Wells's in 1841, and a business partner in 1842, he was invited to speak before the students of the Harvard Medical School, before whom he a little later demonstrated his discovery with incomplete success; that a month later Dr. Marcy suggested to Wells the use of sulfuric ether, and removed a tumor painlessly from the head of a patient under its influence; that in July, 1845, Morton was referred by Wells to Jackson for information about the manufacture of the gas; that Wells, Riggs, and others continued the use of gas till November 6, 1846, when chloroform and ether were substituted, and gas remained unused till 1863; that the use of gas for anesthetic purposes is recorded in the *Boston Medical Journal* of June 18, 1845; that Morton's first successful operation with ether was on September 30, 1846, and that on the 16th and 17th of October following he administered ether to patients at the Massachusetts General Hospital; that about October 20, 1846, Jackson claimed five hundred dollars as compensation from Morton for professional services; that on October 27, 1846, Morton and Jackson made oath to a joint discovery of a compound for the prevention of pain during surgical operations, and applied for a patent, which was granted, but declared null and void in 1863, as such a discovery was not patentable; that on November 9, 1846, Morton declared it was simply sulfuric ether, not a compound; that in the autumn of 1847 Jackson and Morton each claimed to be the sole independent discoverer of anesthesia, and so contended to the end; that in 1847 the Paris Academy of Medicine on *ex parte* evidence declared Morton and Jackson the discoverers of anesthesia; that in January, 1848, the Parisian Medical Society, after a full hearing, awarded the honors to Wells, and elected him an honorary member; that in 1846 the surgeons of the Massachusetts General Hospital gave Morton the credit of being the discoverer of modern anesthesia; that in 1853, five years after Wells's death, Dr. J. C. Hayward, one of the surgeons present at the first operation, wrote that 'to the spirit of Horace Wells belongs the honor of having given to suffering humanity the greatest boon it has ever received from science.'

"Upon the memory of Horace Wells there remains no blot or stain; no charge of selfishness, dishonesty, deceit, or unfairness was ever made; he lived and died, honored and respected by the people among whom he dwelt. We lay our wreath upon his tomb. Would that we to-day might with it crown his head. Coming generations will recognize in him the martyr and the world's benefactor; and on every monument which in the future may be raised to commemorate this great event will be inscribed, 'To the Discoverer of Anesthesia, Horace Wells.'"

Dr. James E. Garretson, of Philadelphia, was then introduced to read a paper on "The Application of Anesthesia to Surgery, and Its Benefits to Mankind." Before beginning the reading, Dr. Garretson observed that there was one in the audience whose shoe-latchets he was not worthy to unloose on this occasion. The audience was electrified when he stated that Gardner Q. Colton, the man who administered the gas to Horace Wells at the first demonstration of anesthesia, was present, and cheered Dr. Colton as he advanced to the stage.

Dr. Garretson then read his paper, in which he referred to Horace Wells's discovery as the culmination of all that had gone before in relation to what we know as anesthesia: "Was not the ghost of anesthesia with the camel-droppings of the desert? Was it not with the dudain, the devil's apple, of the Arab? Has it not been with alcohol since men distilled and knew this agent? Is it not with the poppy through all the ages that fields have been made red by this plant?" "Did Cordus in 1540 see or tell anything about a ghost of anesthesia, as this lay in his sweet oil of vitriol? With chloroform filling the bottles of druggists in 1831, was anybody to be found who had been introduced through its use to the wonderland of Euthanasia?" Horace Wells saw what had never before been seen by mortal man—anesthesia. "It was ages before he was born that ether was materialized, and it was before he was born that nitrous oxid was formulated, and it was when he was in no way thinking about such things that chloroform was brought forth. The seer saw anesthesia." . . . "Was anesthesia, as anesthesia, known to surgery before 1844, as it became known in that year, and since remains known? Not nitrous oxid, not ether, not chloroform, not rapid breathing, but anesthesia. Who was the man of that year? Horace Wells. This, it seems to me, settles the question. Let, however, all deserved honor and glory associate with the names of workers and experimenters as these have enlarged application of the inspiration of the Hartford seer. Ether! chloroform! what would surgery do without them? How could the world do without them? How *did* the world do without them?

"It is not necessary, in this presence, to enlarge, beyond a very few sentences, on the benefits of anesthesia to humanity; are not all here assembled doing and experiencing, each after the manner of his work, what I did and experienced only yesterday? Upon the operating-table of a hospital lay, sleeping sweetly and quietly as ever baby slept, a member of our fraternity. In place of an ordinary neck was a tumor that reached from chin to sternum and from ear to ear. Wherever, as it proved, reaching fingers could reach, prolongations of this mass extended themselves. Salivary glands, trachea, carotid arteries, jugular veins, pneumogastric nerves, all were more or less embraced and wrapped about. Yet, while so horrible a dissection as was required to remove the mass went on, sleeping, dreaming quietly continued, nor was any consciousness had by our brother of his terrible experience until an hour later he awakened snugly tucked away in one of the most comfortable of beds, the tender hand of a nurse wiping away the cold sweat-drops standing threateningly upon his forehead.

"Consider, in contrast, a picture familiar before the day of Wells's inspiration! A mother, her heart welling out in tears, limbs trembling so as scarcely to afford her support, helpless misery marking her countenance, despair striking at her with its thongs of flame, follows into a hospital operating amphitheater a nurse who carries her first-born, which is being brought to the table. Alas, helpless indeed is the mother! How more than gladly, how a thousand times more than gladly would she lie down in place of the child! Cries of mother and child moan through the hospital, and the least sensitive feels his cheek pale. The crucial moment has come. The child is placed and held by force upon the table. The mother is torn away. For a single moment eyes of mother and child have met in parting. A loud, frightened, despairing cry from the child rings from ceiling to floor of the room. The mother drops in a heap and is carried out a raving lunatic,—she raves about and curses God as being without pity or mercy.

"Let a picture of to-day have relation with that other one of the past, one which extended, alas! from the days of the first surgical performance to the year of grace eighteen hundred and forty-four.

"A mother brings to a hospital a child whose deformity requires the knife for its correction. Conscious of the power of anesthesia, the surgeon talks to the parent, while all the while the little patient, pleased and inveigled by the sweet smell of chloroform, is itself anesthetizing itself. The cutting is done. The child has a dream of roses and gardens and wide fields. The mother has placed in her arms her restored offspring. She has no tears, no words; her contact has been alone with beneficence. She is overwhelmed by the mystery met and passed. She says, 'Our Father which art in heaven.' She says and feels there is a God of pity and mercy.

"Look at the name of the maker of these pictures of the new time. It reads, Horace Wells.

"To what extent anesthesia has cultivated sensibility, I leave every surgeon to judge. Who, if suddenly transplanted into the olden times, being possessed of his present knowledge of anesthesia, could handle a knife without cutting everywhere else than where it would be desirable to cut, otherwise dying shortly out of sympathy for his patients? Could he say, 'Merciful Father which art in heaven,' in place of thinking, 'Pitiless devil who is in hell'? Alas! how near to hopeless atheism may ignorance bring a man. Hail! that knowledge shows God and Father everywhere. Hail to all poets, to the music-hearers, to the seers of forms of every kind. Let statues be stood for such in the squares! Let tablets of enduring brass mark their working places! Let us place and hold them with the immortals!

"Hail to him who has proven to be, perhaps, the greatest of seers, —Horace Wells."

The consideration of a plan for a permanent memorial to Horace Wells was announced as the next order of business, and Dr. L. D. SHEPARD, of Boston, said that to crystallize the sentiments of this large gathering of professional men into a formal expression of opinion, the executive committee having this celebration in charge had prepared a resolution, which they had asked him to present, as follows:

*Resolved*, That we reaffirm and emphasize our belief that the observation of Horace Wells was essentially a discovery original with him. We do not claim that his was the first discovery of the same fact, but accord priority in this to Sir Humphry Davy. And with respect to the honors due to each we call attention to the historical fact that it was from the discovery by Wells that the direct benefits to humanity were achieved.

Dr. JOHN S. MARSHALL, Chicago, moved the adoption of the resolution. Carried unanimously.

Dr. ROBERT HUEY, Philadelphia, moved that a committee be appointed to take in hand the matter of the erection of a permanent memorial to Horace Wells in Washington, D. C. So ordered.

The chair stated that as the selection of the committee should be carefully made, the names would be announced at a future time.

At the suggestion of Dr. S. H. GUILFORD, of Philadelphia, Mr. G. Q. COLTON addressed the audience. Mr. Colton was received with cheers. When quiet was restored, he told, as an eye-witness and participant, the story of the first administration of nitrous oxid for the production of surgical anesthesia, on December 11, 1844, when he himself gave the gas to Horace Wells, for whom Dr. John M. Riggs extracted a tooth without pain. Mr. Colton's talk also gave many interesting details about the early days of anesthesia, and of his own reintroduction of nitrous oxid in July, 1863. In the February following he had begun the systematic collection of the names of those who had teeth extracted under the influence of nitrous oxid at the Colton Dental Association in New York, and the names so collected now number 186,600, without a single accident from the gas.

Mr. CHARLES T. WELLS, of Hartford, son of the discoverer of anesthesia, was then introduced, and returned his thanks for the reception accorded him.

Dr. S. C. G. WATKINS, Montclair, N. J., thought there was no time like the present to start the collection of subscriptions to the memorial fund, and he suggested that a treasurer should be appointed to receive funds. Dr. J. D. Thomas, of Philadelphia, was elected treasurer.

Dr. WILLIAMS DONNALLY moved that the committee on permanent memorial, when appointed, shall take into consideration the establishment of a national museum and library. So ordered.

The session then adjourned.

The banquet was held at the Union League at 6.30 P.M.

Dr. EDWIN T. DARBY acted as toast-master. The toasts and the names of the speakers were as follows:

"The Horace Wells Discovery: Its National Significance." General Joseph E. Hawley, United States Senator from Connecticut.

"Anesthesia as a Dental Discovery." Professor James Truman, University of Pennsylvania, Dental Department.

"Anesthesia as a Factor in the Evolution of Surgery." Professor J. William White, University of Pennsylvania, Medical Department.

"The Debt of Medicine to Anesthesia." Professor H. C. Wood, University of Pennsylvania, Medical Department.

"The Mastery of Pain from the Standpoint of the Layman." Col. Alexander K. McClure, editor of the Philadelphia *Times*.

"The Development of our Knowledge of Anesthesia." Professor Wilbur F. Litch, Pennsylvania College of Dental Surgery.

"The Medico-Legal Aspect of Anesthesia." Hon. George S. Graham, District Attorney of Philadelphia.

"The Humanitarian Aspect of Anesthesia." Rev. Dr. S. D. McConnell, Philadelphia.

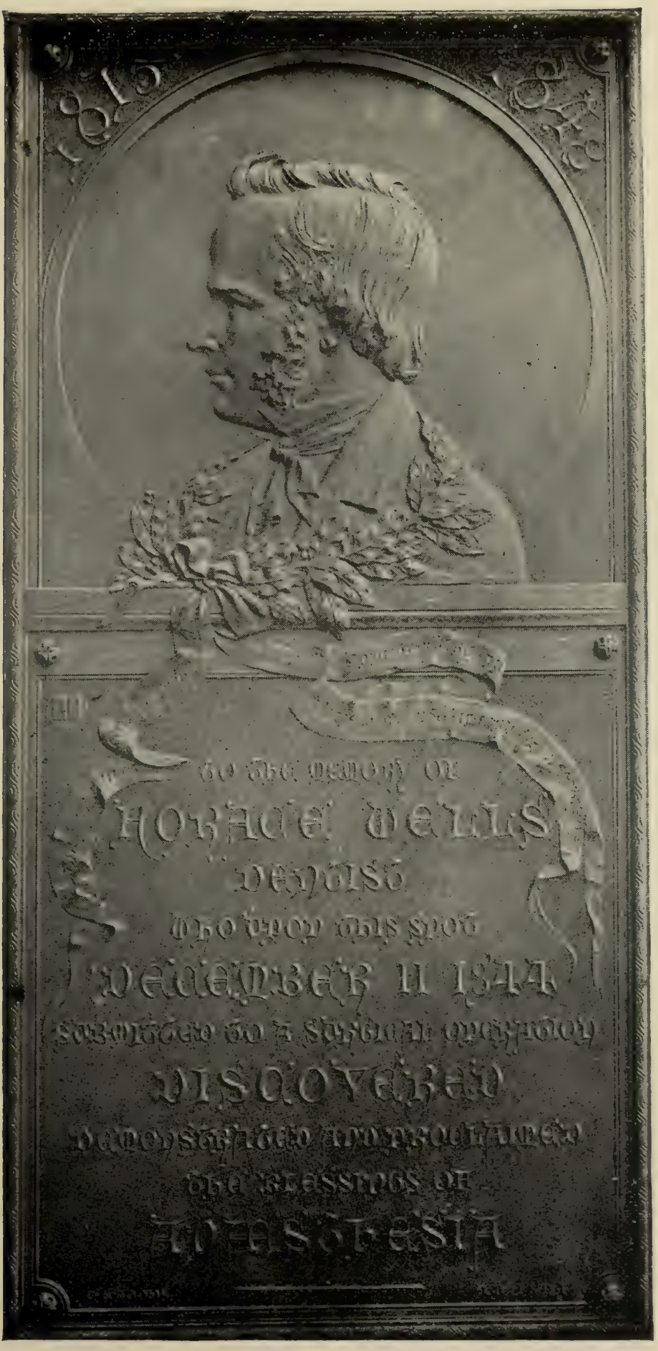
"An Historical Reminiscence." Mr. G. Q. Colton, New York city.

"A Personal Reminiscence." Mr. Charles T. Wells, Hartford, Connecticut.

## HORACE WELLS ANESTHESIA CELEBRATION AT HARTFORD, CONNECTICUT.

A MEMORIAL meeting and banquet was held in Hartford, Conn., on the evening of December 10, 1894, to celebrate the fiftieth anniversary of the discovery of anesthesia by Dr. Horace Wells, a dentist of Hartford. The guests who were present were Governor O. Vincent Coffin, Charles T. Wells, son of the discoverer, Mayor Brainard, Rev. George Williamson Smith, president of Trinity College, Dr. G. Q. Colton, who first administered the anesthetic, Dr. Pickney W. Ellsworth, Dr. Henry Barnard, Dr. Gurdon W. Russell, Dr. H. P. Stearns, E. S. Woods, John Addison Porter, Judge McManus, Dr. George C. Marchfield, Holyoke; Dr. L. C. Taylor, Dr. Charles C. McManus, Dr. Henry McManus, Dr. N. J. Goodwin, Dr. Joel F. Wright, Dr. Monroe Griswold, Dr. Edward Eberle, Roland Swift, Ernst Schall, H. C. Ney, Dr. John Dwyer, R. A. Wadsworth, Dr. Alfred Jones, Dr. Daniel A. Jones, New Haven; Dr. William H. Ryder, Danbury; Dr. E. M. Smith, Newtown; Dr. J. Terry Barker, Wallingford; Dr. S. M. Griswold, Manchester; Dr. M. M. Maine, South Manchester; Dr. F. F. Mullen, Jr., Windsor Locks.

Appropriate speeches were made by Governor O. Vincent Coffin,



1815 1848

TO THE MEMORY OF
HORACE WELLS
DENTIST
WHO UPON THIS SPOT
DECEMBER 11 1844
SUBMITTED TO A SURGICAL OPERATION
DISCOVERED
DEMONSTRATED AND PROCLAIMED
THE BLESSINGS OF
ANAESTHESIA

FAC-SIMILE OF THE MEMORIAL TABLET ERECTED IN HONOR OF HORACE WELLS, AND UNVEILED IN HARTFORD, CONN., U. S. A., DECEMBER 11, 1894.

Mr. Charles T. Wells, son of the discoverer, Mayor Brainard, of Hartford, Dr. C. C. Barker, and Dr. G. Q. Colton, who administered nitrous oxid to Samuel A. Cooley in the presence of Horace Wells, who observing that Cooley had sustained an injury while under the effect of the gas without feeling pain therefrom, thus received the suggestion which resulted in the discovery of anesthesia.

Dr. Henry P. Stearns, a contemporary of Horace Wells, gave an interesting personal reminiscence of his knowledge of the factors in the discovery. President G. Williamson Smith, of Trinity College, Dr. Henry Barnard, another contemporary of Wells, Judge McManus, Dr. Crane, and Dr. Gurdon W. Russell also gave some interesting addresses. At the conclusion of the banquet Dr. James McManus invited all present to march in a body to the site where the memorial tablet had been erected, and afterward, in an appropriate speech, presented the tablet on behalf of the committee to the city of Hartford, as a testimonial from the contributors to the genius of Horace Wells.

The committee desires to publicly thank the following-named dentists from the states and cities of the Union who contributed to the fund that enabled us to procure and place in position, December 11, 1894, a beautiful and artistic memorial tablet to the memory of Dr. Wells, the discoverer of anesthesia.

JAS. MCMANUS, *Treasurer.*

CONNECTICUT.
*Hartford.*
Geo. L. Parmele.
Jas. McManus.
Charles McManus.
Henry McManus.
L. C. Taylor.
N. J. Goodwin.
John N. Welles.
E. R. Whitford.
J. F. Wright.
F. W. Dunham.
Edward Eberle.
Monroe R. Griswold.
Chas. K. Bryant.
J. F. Doebler.
H. J. Fisk.
L. H. Fisk.
Chas. H. Riggs.
S. L. G. Crane.
*Manchester.*
G. M. Griswold.
*South Manchester.*
M. M. Maine.
*New Haven.*
Edward S. Gaylord.
Daniel A. Jones.
Mrs. E. R. Jones.
W. H. Metcalf.
F. W. Brown.
A. B. Smith.
Robt. T. Ehni.
W. T. Holmes.
*New London.*
Edward Prentiss.
R. W. Browne.
A. W. Crosby.
W. W. Sheffield.
F. S. Norkett.
J. R. Linsley.
A. D. Bishop.
*Meriden.*
C. C. Barker.
P. A. Powers.
R. K. MacVean.
D. C. McMahon.
J. J. Flanagan.
L. T. Doolittle.
*Branford.*
David W. Johnston.
*New Britain.*
R. C. Dunham.
A. E. Wales.
P. J. Macdonald.
C. B. Erichson.
*Naugatuck.*
W. F. Gerrish.
*Niantic.*
J. G. Champlin.
*Norwalk.*
Winfield H. Baldwin.
*Bridgeport.*
Civilion Fones.
Alfred C. Fones.
A. E. Fones.
C. W. Strang.
C. B. Adams.
G. F. Williams.
W. L. Ferris.
J. S. Caroli.
Geo. F. Barden.
L. E. Sage.
C. F. Gibbs.
C. B. Baker.
Fredk. Hindsley.
C. H. Porter.
*Danbury.*
W. J. Rider.
W. H. Rider.
J. C. Whaley.
S. W. Chipman.
*Danielsonville.*
O. C. Sharpe.
*Ansonia.*
M. C. Hitchcock.
*Bristol.*
L. L. Beach.
J. S. Wilson.
*Moodus.*
Russell Arnold.
*Middletown.*
O. S. Watrous.
A. P. French.
A. H. Fagan.
Chas. P. Graham.
*Windsor Locks.*
F. T. Murlless.

F. T. Murlless, Jr.
*Wallingford.*
J. T. Barker.
*Thompsonville.*
B. H. Thornton.
*Saybrook.*
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Benjamin Lord.

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VIRGINIA.

*Farmville.*

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*Staunton.*

James Johnston.

WASHINGTON (state).

*Tacoma.*

W. E. Burkhart.

## NEW YORK ODONTOLOGICAL SOCIETY.

At the annual meeting of the New York Odontological Society, held December 18, 1894, the following were elected officers for the ensuing year: Dr. A. L. Northrop, president; Dr. Wm. Carr, vice-president; Dr. A. R. Starr, secretary; Dr. George A. Wilson, corresponding secretary; Dr. J. Bond Littig, treasurer; Dr. J. Adams Bishop, curator; Drs. W. W. Walker (chairman), S. G. Perry, Wm. Jarvie, executive committee.

## WASHINGTON CITY DENTAL SOCIETY.

AT a meeting of this society, held December 18, 1894, the following were elected officers for the ensuing year: Dr. J. Roland Walton, president; Dr. Wm. M. Hunt, vice-president; Dr. D. Elmer Wiber, secretary; Dr. M. F. Finley, treasurer; Dr. Henry B. Noble, librarian; Dr. St. George Elliott, essayist.

D. ELMER WIBER, *Secretary*,
717 Eleventh street, N. W.

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# DENTAL SOCIETY ANNOUNCEMENTS.

## JOINT MEETING AT PITTSBURG.

THE union meeting of the Lake Erie and Pittsburg Dental Societies will be held in Pittsburg on the 24th and 25th of January, 1895, instead of on the 23d and 24th, as announced in the DENTAL COSMOS for December, 1894.

J. A. LIBBEY,
524 Penn ave., Pittsburg, Pa.

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# EDITORIAL.

## THE HORACE WELLS ANESTHESIA CELEBRATION.

THE movement originating, we believe, in Philadelphia, early in the year just closed, having for its object the celebration of the fiftieth anniversary of the discovery of anesthesia by Horace Wells, of Hartford, U. S. A., has been carried to a successful culmination,—successful not only in material details (and in this respect the event was beyond all criticism), but successful in a larger and more important sense, because through the evidence adduced at the meeting there was gained the unquestionable establishment of the right of Horace Wells to first honors as the true discoverer of this boon to humanity. We publish elsewhere a brief report of the national celebration in Philadelphia, as well as of that held in Hartford, at which latter the memorial tablet to Horace Wells was unveiled and presented to the city of Hartford, where the discovery was made. We understand that an official report of the national celebration is to be issued as a souvenir volume, if a sufficient demand for the work on the part of the dental profession should warrant the committee in undertaking the expense. The report should be issued, as the evidence which the occasion has brought forth is novel and exact, and cannot fail to be convincing to any but the wilfully blind. It places the vexed question of the history of the discovery of anesthesia upon an accurate basis, and thus settles it beyond dispute.

The banquet furnished occasion for the presentment of important contributions to the historical side of the question; and while we would not draw comparisons as to the relative merits of the speeches there made, that of Professor James Truman, on the subject "Anesthesia as a Dental Discovery," so ably portrays the motive spirit of the whole movement that we here reproduce it in full, with the feeling that we cannot otherwise better present that most important view to our readers.

Professor Truman said,—

I have been impressed to-night with the story with which you are all familiar, or were familiar with in your early childhood,—the story of the Ugly Duckling, by Hans Christian Andersen. You remember that this ugly duckling came out of his shell late; he was picked at, was persecuted, and loved by no one, and the only talent he had was that he was able to swim. As he passed on through life he happened upon a tribe of wild ducks, and the leader of the ducks said to him, "You are very ugly, but you can swim and you can fly, and I think I will adopt you into our tribe; but you must remember you are never to marry into our family,"—and eventually the duckling became a beautiful swan.

Now, it seems to me that dentistry occupies, in its relations to the professions, very similar characteristics to that ugly duckling. It was born late. It began its life in the middle of the last century, and has been growing and building its own centers of instruction, laying its foundations in therapeutics and pathology, and upon experience creating a profession worthy the name. Standing here this evening before this august assembly, I feel that the representation from fourteen states gathered here to do honor to one of our number indicates a professional spirit that rejoices my heart.

When Horace Wells, in Hartford, in 1844, discovered the properties of anesthesia, unnamed at the time, did he confine it to his own selfish purposes? It was a transition period in dentistry. Every professional man's hand was against every other man's. Horace Wells was broader than those with whom he came in contact. He desired to give the benefit of his knowledge to that "greater world," as Goethe loved to call it. He believed it was capable of being used in major surgery, and did all that was possible to arouse interest among medical practitioners. He went to that great center of medical instruction, Boston, and gave an exhibition before the medical faculty and students, and was hissed from their presence. This action will ever remain to the discredit of the medical profession in Boston.

But Boston is not alone in this; for every age has stoned its prophets, and will probably continue to do this to the end of time.

Dr. B. W. Richardson, of England, has in these latter days, and indeed in the past few weeks, in *Longman's Magazine*, undertaken to tear the mantle from Horace Wells's shoulders and place it upon those of Sir Humphry Davy. It has been a long period to wait to perform an act of this character; ninety-four years since Humphry Davy undertook to promote the discovery of Priestley.

It is pertinent just here to consider what constitutes a discovery. It is certainly true that very few new things are born into the world through the unaided efforts of a single individual. The inspirations, apparently floating through the mental ether of the world, drop here and there as in the parable, some on rocky, some on poor, and some on fruitful soil. That falling on rocky soil dies in its birth, that on poor soil fails to produce but a weakling, but the third brings forth fruit worthy of the generation. It fell upon Priestley, and there was no germination; on Sir Humphry Davy, and it ended in a dream; on Horace Wells, and the result was for the comfort and healing of the nations.

Has this introduction of anesthesia been of any real benefit to dentistry? I might say almost nothing. To be sure, in the earlier "duckling" age of this profession, the extraction of teeth was the principal business of the operator; but to-day dentistry has grown far beyond that. We might now follow the old Delphian idea and hang up in our temples—in our operating-rooms and offices—the leaden forceps indicative that no tooth should be removed until it could be extracted by such an instrument.

When Dr. Richardson wrote the article alluded to, he very vividly described the condition of surgery just prior to the introduction of anesthesia. He recalls the feelings of the surgeon, with all the care and anxiety of the day before him; the horror of the students, and the cries of the patients. Is it any wonder that there was intense excitement when the surgeon entered the class-room and announced that there would be no lecture that day, "that he had a piece of news to communicate—nothing less than the discovery of a method by which the most important surgical operation could be performed while the patient was asleep!" The news had come from Massachusetts Hospital. It is not surprising that the students followed the surgeon to the amphitheater to see this wonderful operation. Was there one in that excited audience who thought of Sir Humphry Davy? No, he was entirely forgotten.

When we contemplate the past history of the world, the horrors of the battle-fields, the terrors of the hospitals, and the accidents of life, the mind falters in its attempt to grasp the aggregate of human misery. Who can translate this into words suitable for modern comprehension? This wail of the ages was voiced in the Garden of Gethsemane, when the Great Master of human thought, in anticipation of the cruel agonies of the cross, lifted up his voice and prayed, "Father, let this cup pass from me!" Eighteen centuries passed into oblivion with no response; but near high noon of the nineteenth, in the new world of Columbus, in a humble home in Hartford, there arose a "still small voice" sounding above this wilderness of suffering. It was wafted over the deep waters, echoed and re-echoed in joyous acclaim throughout the world: "Lo, the cry of agony from the surgeon's knife is silenced forever."

We cannot deify thee, as the ancient Greeks would have done, but we give thee most hearty thanks, and in our heart of hearts we enshrine thee, O Anesthesia, goddess of our modern civilization! though not the first-born, the loveliest of all the children of discovery in this our nineteenth century!

## DR. PATRICK'S REPORT.

We publish in this issue the final report by Dr. Patrick of his work in the examination of human crania. The full report represents a careful and painstaking research extending over a number of years, and embraces a number of previous reports which have been made to the American Dental Association, under whose auspices and by whose direction and financial aid the work has been finally carried out.

The dental profession may well be congratulated that this important collection of data has been placed in such shape that it may be utilized for further study and investigation. Such work is a necessary preliminary to all truly scientific study, and while its value may not at once be apparent to every one, the fact remains that the men who at great personal sacrifice pursue investigations of this class for the benefit of their colleagues deserve their thanks and praise for the advances thereby attained in exact knowledge of the phenomena with which we are called upon to deal.

## STOMATOLOGICAL CLUB OF CALIFORNIA.

We notice in the November issue of the *Pacific Coast Dentist* that the name of the San Francisco Dental Club has been formally changed to that of Stomatological Club of California. The editorial in the September issue of the *Pacific Coast Dentist* seems to have borne good fruit. The prophet is not without honor in his own country occasionally.

## EXCESS OF MATTER.

We are compelled to carry over to the next issue a considerable amount of important matter for lack of space in the present number. The reports of the New Jersey State Society, the Union Meeting at Buffalo, the Midwinter Fair Congress, the Second District Society of New York, Periscope, and Obituary Notices are thus crowded out.

# BIBLIOGRAPHICAL.

Brook Farm. Historic and Personal Memoirs. By John Thomas Codman. The Arena Publishing Company, Copley Square, Boston, Mass. Price, cloth, $2.00.

Dental writers in the field of general literature are making a record for themselves and their profession.

This work by Dr. Codman is a most admirable and readable account of a sociological experiment which has left a decided impress upon the intellectual development of our nation. The characters concerned have been among the strongest that this country has produced, and this alone makes the history of a movement in which they were concerned interesting and instructive.

The narrative is historically correct, and delightfully told by one who was himself identified with Brook Farm.

# PUBLISHER'S NOTICE.

## THE DENTAL COSMOS AND ITS SUBSCRIBERS.

THE DENTAL COSMOS has a larger *bona-fide* list of paid-up subscriptions than any other dental journal in the world, and it includes among its subscribers and readers nearly every English-speaking dentist who is recognized as a power in his profession. It is almost a sure test of a dentist's position, whether he is or is not a subscriber to the DENTAL COSMOS. If he is, he may be reckoned among those who practice dentistry intelligently, according to the best light attainable, and such a judgment will rarely be wide of the mark.

Men of this character want the best journalistic literature they can get; they want also to know all that is going on in their profession, and experience teaches them that the DENTAL COSMOS supplies both. They find in its pages the writings of the ripest scholars, the thoughts of the most profound thinkers, the researches of the most earnest investigators, the products of the ever-alert inventive genius, the methods of the practical workers of dentistry; in a word, all that is useful in theory or practice.

As a consequence, they appreciate the monthly visits of the DENTAL COSMOS, and each recurring year finds them attesting their estimate of its value by renewing and paying for their subscriptions. Therein is the secret of the great power and influence of the DENTAL COSMOS. It has a clientele which values it. Their confidence is not misplaced. The unending effort of editor and publisher is to make it the best that the progress of the profession will permit. We should be glad to have every dentist on our subscription books, and we are sure that the upward impetus of dentistry would be quickened if it were so; sure also that every individual subscriber would feel that he was receiving the worth of his money.

This issue is sent to every subscriber to the volume which ended with December, 1894, whether he has renewed or not. In accordance with our custom, unrenewed subscriptions will then be dropped.

To correct a misunderstanding which seems to exist in some quarters, we will state that the bills sent out in the December issue were for the year 1895, and so served as notices of the expiration of subscriptions. It was not intended to imply that those who received them should of necessity remit to us directly. Any reputable dealer in dentists' supplies, or any of our branch houses, will receive and forward renewals.

Subscription price, $2.50 a year, post free to the United States, Canada, and Mexico; $3.00 to other Universal Postal Union countries. Subscriptions must begin January or July.

THE S. S. WHITE DENTAL MFG. CO.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.

**Adress**-Buch der im Deutschen Reiche, der Oesterreichisch-Ungarischen Monarchie, der Schweiz, den Königreichen Belgien, Niederlande, Dånemark, Schweden und Norwegen in selbständiger Praxis thätigen approbirten Zahnärtze, American Doctors of dental surgery, im sonstigen Auslande diplomirten Dentisten, Zahnkünstler und Zahntechniker nach Ländern, Provinzen und Städten geordnet nebst einem Anhang bezüglich der grösseren Städte Russlands, Rumäniens, Serbiens und des Orients. Ausgabe für 1894–95. Berlin, 1894, E. Richter, 282 pp. 16°.

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THE

# DENTAL COSMOS.

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## ORIGINAL COMMUNICATIONS.

### POPULAR DENTAL EDUCATION AND THE NEWSPAPER.

BY J. C. WALTON, D.D.S., HOWELL, MICH.

To those to whom the subject of personal appearance counts but little, who know nothing of enunciation as a fine art, who never plan for future comfort and health, or with whom hygiene and cleanliness is a vague fancy unworthy of serious consideration, a tooth is of little value. Outcropping popular notions concerning the importance of dentistry are often humiliating, indicating vividly and truly our position among the professions.

Lack of professional qualifications and of moral responsibility to some extent now, but more especially in the past, are responsible for this lack of confidence in us. Promises unsupported by actions belittle us professionally. Indiscriminate harm is worked by destroying public confidence. The miserable inefficiency and deceit of the dregs of the profession is recognized by the few, but not by the many.

There are millions of teeth being sacrificed because the masses do not know the possibilities of our art. Thousands are suffering agony untold because they do not know where to get relief, or have not the educated courage to apply to a dentist. Occasionally people die from causes that we should understand and can remedy better than any one else. At the same time there are many of us impatiently sitting in our offices waiting for an opportunity to sell our services to just such people. With a lack and a want of dental service on the one hand, and a lack and a want of employment on the other, matters are left to balance themselves somehow.

There are seventeen thousand dentists in the United States, of whom many are desperately idle, while there is dentistry enough undone that could be done to satisfy fifty thousand. What is lacking is some method of establishing a change of sentiment on the part of the public, giving information concerning their dental needs and possible betterment, directing attention to the proper source of service, etc., denouncing evil and announcing good, thus counteracting the effect of fraudulent and inefficient practice. The needs of the people and the needs of the dentist should be made to fit each other. Such a way should have the support of the best element in the profession, but should not be perverted to support its selfish ends to the exclusion of popular need. It should be attractive to the average practitioner, and, if possible, to those on the lowest rounds of the professional ladder. To meet these requirements, it must be in an educational way. The benefits likely to result from the popularizing of such information have been seen and discussed, but no acceptable plan devised. The subject should not be shelved.

With everybody needing dental aid, and large additions to our ranks being made yearly, some modern means of conveying thoughts sure to be of benefit to mankind seems a logical necessity. It is but concrete professionalism and common sense amalgamated.

The quack, with an audacity in inverse proportion to his qualifications, is the educator of the masses to-day. With illustrations and deceitful advertising he attracts and educates, right or wrong. The time is ripe for competent educators to bear a hand. To our shame, the commercial spirit in our ranks has pulled the profession, against its declared will, this way and that. Despite our protestations, amalgams, rubber, celluloid, porcelain teeth, crowns, and bridge-work are what they are, and, in general, fairly well used, because of the demand of people educated by commercialism.

"Painless dentistry" has been forced upon us in the same manner. Commercialism has made the more successful appeal to the masses, and it is because of its success that we hate it ; yet we have profited thereby, for it is by meeting such resistance that we develop. The commercial dentist is restless and aggressive, and we cry out against his efforts to monopolize the business, but the people profit by it in the long run in better and cheaper dentistry. Thus the dark side of dentistry is not without its compensations.

But incompetent dentists are everywhere taking advantage of the people's ignorance. Commercialism profits by the popular demand, and ultra-ethicalism loses by a blind adherence to a chivalrous sentiment. It is now time for our conscientious, practical men to step forward and make themselves as useful as possible to their fellows and to the community. To this end they must instruct their people when instruction is needed, and by force of character and reason lead them. The time is past when the physician or any one else should dominate in dental matters. When we find an effective way to give good instruction and follow with good service, the relation of dentist to patient will be more honored, and complimentary, and remunerative. There is little humanity, and less philanthropy, in withholding beneficial knowledge where innocent ignorance is of necessity the greatest sufferer. Humanitarian interest in mankind should be stimulated rather than smothered.

We are dependent upon public favor for the opportunity to be useful. Prominence is evidence of public approval. Public educators in any line attain more or less prominence. Prominence adds profit and satisfaction to any dentist, and is rightly sought by all. We should manage the relationship with skill, honesty, and prudence ; but "we" should direct, and not the public. If we lead, we must also teach. Leaders are expected to say something. The giving of proper instruction will be found the basis for a confidence that is not easily shaken. To be successful we must inspire and retain public confidence. It is the best, nay the only, way to allay that mistrust of dentists which is so widely prevalent.

That there is a popular doubt about our being equal to our present tasks is often seen. That our profession is a resort for the half educated, the tricky, the shiftless, is a not unpopular notion, and is well sustained by our present newspaper contingent. Who enjoys seeing this notion of our educational standard maintained? Will not proper efforts change it? In this state of things it is a satisfaction to know that our best men do maintain the standard of a scholarly profession. This, however, is not enough. We want the world to know it, to profit by it, and we also wish to profit by it.

Education is the best weapon with which to meet competition, incompetency, and deception. Ignorance is an influence most potent for harm. The errors of incompetent dentists, past and present, defeat us often. The itinerant is not so long out of date as to be forgotten. He lives in the memory of our older people, and his failures are reported to the third and fourth generations. The news that a change is taking place in the average ability of dentists is not yet confirmed in the minds of half the people, and of these a large percentage are subject to a discouraging lapse of faith.

"Have it out and be done with it," and other stereotyped expressions, betray the impatience and lack of confidence still current, and suggest an action to the impulsive that is likely to bring regrets. People should be told that they are not done with it when the natural teeth are gone. We need to put into current language simple, effective expressions that will suggest a contrary action. They must be repeated until they are memorized by everybody. "Teeth extracted without pain." With what chagrin do many of us face these immortal words. To the intelligent the deception is becoming manifest, but the harm has gone on until ministers and actors crack jokes about the abominable phrase. It is an obligation that we should sympathize with those who suffer, and seek to alleviate or prevent pain, but the seductive charm in these words has been recognized by us for years and winked at.

It is high time every honest practitioner should be encouraged to raise his protest against practicing dentistry as a confidence game. It is a low and unworthy view any one takes of his office when he assumes that he has nothing to do with public ignorance, except as he may be called upon to operate for a compensation. The past years have been prolific in acts of indiscretion, and danger little short of crime. Public sentiment tolerates and invites the infliction, because it knows no better. It is a reproach upon us which crops out in current literature, and from the pulpit and the stage.

Professional history is the story of an endless conflict between the intellectually strong and the weak, the strong grasping always for more, the weak striving ever for enough. Sometimes the struggle is for professional dominion, sometimes for lucrative possession. It matters not in the last analysis; both mean the same,—control. Sometimes the strong win by intellectual acumen. At first their weapon is the code; anon it is the law. First we appeal to the Don Quixote element,—chivalrous sentiment,—resting long, hopefully secure in its shelter. Later we begin to chafe under code restrictions, and seek to interpret more liberally. In recent years legislative enactments have been sought and obtained, but we have not begun to enjoy dominion before we discover that public sentiment does not favorably support us, and we fail to dominate; test cases of Michigan's new law in Grand Rapids showing plainly a lack of popular support.

The intellectually and numerically weak element, having no chivalrous sentiment to support, have adopted tactics and weapons adapted to our time. They choose the machine gun; we the popgun. They effectually reach thousands daily, while our method reaches one weekly. I am aware that any suggestion about the use of the public press arouses the fear that professional welfare will be imperiled by the ignorant and vicious. There should be no such fear. Intellectual force is the very highest power, and in the end, with equal chance, overcomes every resistance.

We have seen that dignified, uncompromising silence does not enlighten our citizens; that society management is careless or incapable; that those who have made any effort have practically wasted their capacity in trivial ways and need suggestions. We are growing to see that the true value of education is its power to solve in the quickest and surest way our position toward each other and the people. By the proper use of educational means we shall win recognition if we are efficient.

Scrutinized without prejudice, any successful plan should be welcomed as an onward step in the march of the profession, which, though often hindered, has never been turned backward during the past fifty years. Without it our condition and position alike must remain insignificant, and we must continue to bear no helpful part in the affairs of public health, sanitation, or hygiene. The army, navy, prisons, reformatories, asylums, hospitals, and public charities in general will never use us for any purpose but tooth-pulling. We have something to do more than declare our position to convince the world.

Many of us have undertaken the fight with pamphlet popguns, as recommended from time to time by the American Dental Association (see report Section II, Dental Education, etc., 1894). The objection to this plan is that it is ineffective.

The masses read the newspaper when they read anything, therefore to ignore them is to shut out the dawning hope of popular dental education. It may be it should be a powerful factor on the side of right and reform, and a silent worker of extensive influence against which no argument can be sustained. It can be made the best as it is now the most dangerous missionary agent in the world. It is the resource we need for popularizing effective dental teaching. Impatient contempt of such means is not wisdom, and is not justified in the light of failure of other means.

We, the profession, are responsible for the widespread ignorance and misinformation about dental affairs which prevail everywhere. The meager scraps of information circulating among the masses are ill-chosen and unrepresentative. Proper sentiment and correct instruction spread in the newspapers would counteract these absurd popular impressions. Then, too, teaching implies growth and continuous self-culture. We will grow intellectually by our efforts to instruct; our services will be more valuable to our patients; and they in turn will quicker learn to appreciate our success.

This tendency to oppose any method of instructing that does not savor of the old-fashioned is one of the brakes that prevent the quick transmission of acceptable impressions of our aim and status. Such opposition is based on the erroneous notion that we are not justified in adopting any means used by the commercial world. All matters of human interest may now appear in our newspapers. The most trifling things, as well as science, religion, and philanthropy, constitute its legitimate domain. The great question of life in all its forms is its constant theme. Information that is educative and correct should be acceptable to the profession and the people, and, without catering to a low plane of traffic, it will direct the community in dental intelligence. Profit to the masses and ourselves will follow. Secretly we are all conversant with the causes and springs of action in professional life. There is such a thing as legitimate gain. To protect or increase it is an admissible, admirable ambition. The better educated the dentist and the better educated his patients in dentistry, the more secure he is in his practice and the better compensation he may expect. The talk of the time which assumes that we forfeit the interest of the profession by attention to the business side of it is not justified by results.

There are in the United States 14,017 publications of weekly issue, 235 publish twice a week, 31 every other day, and 1835 publish daily. Altogether their total issue is 4,000,000,000 copies per year. If every dentist were to put out 1000 pamphlets in a year, the total would only be 17,000,000, or about 1 to 235. Probably not one person in a thousand has ever read such a pamphlet.

We are admonished by our code that "it is our duty to enlighten and warn the public" (see Article IV). A liberal interpretation will permit the means here advocated. The newspaper is at once the most acceptable to the masses, and the surest, quickest, and most economical way for us to reach the public. Let our state societies lead by creating an editorship and adding from two to five counselors, who shall be in sympathy with the object, understand their duties and the needs of the people. To the editor let any one send two copies of any article he wishes to publish, one to be filed and the other to be sent back approved, or corrected and approved. Their duties will be to watch over all publications, assist in supplying matter, secure the public against falsification and error, encourage and stimulate the profession to educational effort, and see to it that nothing is sown broadcast unless inspired with full information and prepared after deliberate reflection.

Such a plan is liberal, just, ethical, and philanthropic. It may be made effective and profitable. Add to this the quick investigation and report of new nostrums, processes, methods, machinery, etc., upon market appearance, and we shall soon reach the professional position we deserve. If this present educational inertia is not followed by emphatic changes, the professional disgrace, the internal discord, and the public danger of the past will be the condition of the future.

# PYORRHEA ALVEOLARIS TREATMENT, CONCLUDED.

BY W. XAVIER SUDDUTH, M.A., M.D., D.D.S., UNIVERSITY OF MINNESOTA.

(Read before the Minnesota State Dental Association, September 12, 1894.)

In treating pyorrhea alveolaris, it must be remembered that in the simpler forms of the disease we only have to deal with an acute catarrhal process that is easily amenable to palliative medication combined with such mechanical handling as the case may seem to indicate.

Care should be observed in the removal of any local cause of irritation, such as salivary calculus, broken-down teeth, and diseased roots, to replace misfitting plates, to thoroughly cleanse the teeth, and prescribe a soothing mouth-wash.

In a great many cases an alkali is indicated, which may be applied locally or administered internally as the needs of the case seem to indicate. I have found an acid condition of the oral fluids accompanied by an atonic dyspepsia present in a considerable number of cases, which is greatly improved by the internal administration of the following:

℞—Infusum columbæ, ℥iv;
Liquor potassæ, ʒss.—M.

*Sig.*—A dessertspoonful *ter in die* before meals.

If the urine indicates a condition of general acidity of the system, this may be relieved by giving bicarbonate of potassium well diluted, or in the form of an effervescent draught; one of the best means is the old familiar cream of tartar lemonade, made by dissolving a quantity (1 to 18) in boiling water, and adding some sliced lemons and sweetening to suit the taste. It may be partaken of freely until the saliva loses its ropy character.

Trimethylamin breathed in through the mouth for a few minutes at a time will increase the flow of saliva, and at the same time restore its alkalinity. The catarrhal condition is, however, to be treated by topical applications, which may combine some form of alkali, as in the following:

℞—Potassii chlorat., ʒj;
Acidi carbol., ʒss;
Glycerol, ℥j;
Aquæ dest., ℥iv.—M.

*Sig.*—To be used as a mouth-wash, or painted over the affected parts.

Lead-water and laudanum has long been used as a palliative wash after the removal of calculus. The following is a convenient formula:

℞—Plumbi acetatis, ʒss;
Tinct. opii, ℥ss;
Aquæ dest., q. s. ℥iv.—M.

*Sig.*—For local application only to the gums.

Or the wounded parts may be painted with the dental tincture of aconite and iodin.

I have also found resorcin a very useful drug to use in these cases. It may be used in the form of ten per cent. aqueous solution or in the following:

℞—Resorcin, ʒij;
Sodii salicylas., ʒj;
Sodii biboras, ʒj;
Glycerol, ℥iv;
Aquæ, q. s. ad. ft. fl. ℥viij.—M.

*Sig.*—Lotio, *ter in die.*

Dr. Carl Seiler's tablets in solution make a most excellent wash.

Thiol in the powdered form may be sprinkled over the gums with good results, or applied to the wounded parts as an ointment with cacao butter in the strength of one per cent., or in the liquid form it may be penciled over the gums. It is absolutely inodorous, and very efficacious as a palliative drug.

An old standby in somewhat modified form is to be found in the following:

℞—Acid. boric., ℈ij;
Tinct. myrrh., ʒjss;
Aquæ, ℥vjss.—M.

*Sig.*—Lotio.

Oil of eucalyptus in combination with other antiseptics, thymol, camphor, etc., used as a spray or penciled over the surface, are excellent remedies. To these may be added the proprietary medicines, such as listerine, aristol, phénol sodique, creasote carbonate, tribromphenol-bismuth, and cocillana, fluid extract used as a spray.

In the chronic and suppurative form of pyorrhea the general line of treatment should be stimulating and antiseptic for the local lesion, combined with constitutional remedies when complications present.

Let us first take up the uncomplicated form, where there is more or less destruction of the alveolar process, with consequent loosening of the teeth involved. The first step in treatment is mechanical, consisting of the thorough removal of all calculus, salivary and serumal, from the neck and roots of the teeth, and washing out the pockets with some antiseptic solution that will put the parts in a better hygienic condition. After a number of years' experimentation, I have settled down to the use of $H_2O_2$ as the best agent to begin treatment with. It is a mechanical cleanser and antiseptic combined that has no superior. It is very diffusible, and readily penetrates into all pockets and sinuses, bringing the *débris* to the surface. There are a number of different preparations on the market, but for stability and variety of form I have no hesitation in recommending pyrozone, manufactured by McKesson & Robbins. The three per cent. aqueous solution contains less than one-twentieth of one per cent. of free acid, and the five and twenty-five per cent. ethereal solutions only a trace. The presence of a small proportion of acid is essential to the stability of all preparations of $H_2O_2$. Its presence is not, however, detrimental, as it can be readily neutralized by the addition of one or two grains of carbonate of magnesia, or what I consider better still, by using a part or a whole tablet of soda-mint. This must be added to the portion of pyrozone to be used in the treatment, and not added to the stock, for the reasons above stated. So used, it produces marked effervescence, and by liberating the extra atom of oxygen more rapidly than without it, adds materially to the value of the drug as an antiseptic and cleanser. Another precaution that is well to observe is the bringing of the solution to the temperature of the body by immersing the beaker containing the solution in a vessel of hot water. By so doing, the temperature is raised and pain is many times avoided in its application. The high temperature also favors disintegration of the solution. The three per cent. form, prepared as above, is used from time to time during the process of removal of the calculus from around the roots. The mechanical treatment of these deposits cannot be too thorough, and seldom can be accomplished at one sitting without prolonging the operation too long. After removing the calculus, attention should be given to the articulation as one of the causes of mechanical irritation. This is too often overlooked by dentists. If any particular tooth is striking too hard, so as to give rise to pericementitis, it should be ground off, or a rubber cap placed upon the adjoining tooth until the pericementitis shall have subsided and the tooth settled back into its socket. Many times it will be found that there is a permanent malocclusion that may give rise to a recurrence of the irritation. In such cases, the irregularity must be corrected by mechanical means, such as regulating or grinding off the offending teeth, or capping the adjoining teeth that may have been unduly worn down.

Before dismissing the patient, prescribe three per cent. pyrozone and soda-mint as a mouth-wash, and let two days at least intervene before making a second appointment, so as to allow for the certain improvement in the local conditions before resuming the mechanical treatment. At the second sitting, the pockets should be packed with cotton saturated with three per cent. pyrozone and cocain, and allowed to remain for a few minutes before beginning operations. By so doing the pockets will be distended, and the cocain will produce local anesthesia, and lessen the vascularity for the time being, although the subsequent hemorrhage will be the more profuse by reason of its use. The dilation and blanching of the parts by the cocain solution will enable the careful operator to thoroughly examine all the exposed surfaces, and determine whether or not he has removed all concretions.

In case he cannot see all parts of the pocket, he must depend upon a cultivated touch to determine as to the thoroughness of the cleansing process. Any small portion overlooked will serve as a nucleus for further deposits and prevent absolute cure. After satisfying one's self of the removal of all deposits from the roots, then rinse the pockets out thoroughly with three per cent. pyrozone, and finish by using the five per cent. solution. If a stronger solution is wanted at this sitting, it may be obtained by shaking together two parts of the twenty-five per cent. ethereal solution and one part distilled water, and separating through a funnel. The lower portion will be found to contain about a twenty-five per cent. of absolute $H_2O_2$ aqueous solution, which may be diluted to any strength desired, and used with perfect safety, as it will not injure healthy tissue, although destroying granulation, infected, and diseased tissues. Healthy tissues are bleached white by its action, but soon return to their normal condition.

For applying the stronger solutions, I have adopted the well-known medicine drop-tube, by drawing out the points of several and giving them different curves, some rights and lefts, and some simply right angles. Instead of the white rubber bulbs I use the black ones, as they are not affected by the pyrozone as are the white ones. With this simple and inexpensive syringe I can introduce the five per cent., and even the twenty-five per cent., solutions with convenience and perfect safety. Nevertheless, I always take the precaution to dip my hands in water before using these solutions, and to moisten the patient's lips, and keep a wet napkin over the lower portion of the face as a safeguard against the desiccating effect of the drug should it come in contact with healthy tissues.

At the close of the second sitting the patient is instructed to continue the use of the three per cent. solution freely, and return the next day but one following, when, if any of the teeth do not seem to be improving, the pockets are again packed with the three per cent. solution and cocain, and a third attempt made to discover any overlooked deposits on the roots. In case the pockets still appear angry, and the teeth remain loose, they should be treated with the twenty-five per cent. ethereal solution, either by using the drop-tube, or by wiping them out with cotton saturated in the solution, and wound around a Japanese toothpick held in an adjustable handle that will allow of the placing of the pick at different angles. The patient is dismissed with careful instruction as to absolute cleanliness of the oral cavity, and, if necessary, shown how to use the brush and floss silk between the teeth. In most cases this is all that is necessary, and the continued use of the three per cent. solution of pyrozone as a mouth-wash will accomplish a permanent cure. Some object to the soapy taste left in the mouth by the drug, but this soon disappears, especially if the soda-mint is used as directed. From the success that has followed the above system of treating pyorrhea alveolaris in my hands, I am fully convinced that no one drug will accomplish as much in as great a number of cases as the pyrozone solutions following thorough mechanical treatment.

If a considerable portion of the alveolar wall is lost by absorption, then it will be found necessary to fasten a number of teeth together, and thus secure immobility, a condition very essential to the best results in bad cases. This may be done by ligating with cord or wire, but is, however, better accomplished by bands soldered together, or by raised caps cemented into the teeth loosened by disease, and, perhaps, in some cases, including a few teeth not diseased.

In some instances, however, by reason of lack of co-operation of the patient, or his systemic condition, success does not immediately follow. In such cases other lines of treatment are necessary. If the tissues remain flabby, and fail to shrink around the teeth, I have found the chlorid of zinc a most excellent remedy. It is antiseptic and astringent. In fact, before the advent of $H_2O_2$ I used it almost altogether, in full strength, fifty per cent. solution for the pockets, and well diluted as a mouth-wash, as follows :

℞—Zinci chloridi, gr. xx ;
Aquæ dest., ℥iv.—M.

*Sig.*—As directed.

Begin using it three times daily, diluted four times, and continue its use until the gums are blanched. It gives a "persimmony" taste, and is not unpleasant. Insist on having distilled water used in compounding the prescription, otherwise there is danger of a flocculent precipitate forming if kept for any length of time. This is probably due to the presence of carbonate of ammonium in the water, which may be overcome in stock solutions by the addition of a small quantity—a few drops—of hydrochloric acid. Some druggists object to filling the recipe on account of the poisonous character of the drug. Always instruct the patients as to its poisonous character, and caution them to keep it out of the way of children.

In 1888 I called the attention of the profession to sozo-iodol and zinc as a remedy that gave promise of being of use in the treatment of suppurative catarrhal conditions. I have had it in almost constant use ever since, and find my predictions more than verified. Since the introduction of sozo-iodol I have discarded the use of iodoform entirely. Its odor has always been the bane of the practitioner, and now that we have a substitute that is odorless there is no excuse for its use in dental practice.

Sozo-iodol is a di-iodo-phenol-sulfonic acid, and contains fifty-five per cent. of iodin, twenty per cent. of phenol, and seven per cent. of sulfur. The salts are odorless, and vary as to solubility. Sozo-iodol and zinc dissolves quite readily, while the mercury combination dissolves more slowly. The credit of its discovery belongs to a Californian, whose name I am sorry not to have at hand. The first reports I can find of its use as a medicament, topically applied, are two articles by M. A. Fritsche, *Therapeutische Monattschrift*, June, 1888, and *American Journal of the Medical Sciences* in October of the same year, where he reports eighty-two cases in which he used it in the treatment of nose and throat troubles with marked success.

Bufalini reports its use internally in May, 1888, in the *Annali di chima e di Farmacologia*, Milan, and in the *Medical Chronicle* in October of the same year.

L. Larmuth, in the latter journal, also reports favorable results obtained in nose and throat cases, and suggests that all the salts may be made up as ointments with lanolin as the base.

Hermann Suchanuck, May, 1889, in *Correspondenz-Blatt für Schweizer Aertze*, confirms Fritsche's results of the previous year, and Mitschman, January, 1890, in *Therapeutische Monattschrift* suggested the use of five to seven per cent. solution instead of the insufflations used by Fritsche and Suchanuck, in the form of a douche, or painted over the parts with a camel's-hair brush, and claimed that sozo-iodol and its salts could not be too highly praised as topical applications in all forms of catarrh.

Schwimmer suggested the addition of two and one-half per cent. of laudanum to the solution of from one-half to one and one-half per cent. of the sozo-iodolate of zinc in all acute cases of catarrh. As to the present status of the drug in medicine, I cannot do better than quote from the "Annual of the Universal Medical Sciences," where a writer refers to the therapeutic uses of iodol, which he speaks of as the "succedaneum of iodoform." The works of Vulpius and Mazzoni, Wolf, Schmidt, Piermarino, Pick, Cervesato, Martin and Lublinski, Seifert, Szadeck, Arago, Talenti, Hoffmann, Glassner, Shetler and Purjesz, Stembo, Valdez, and Cerna are brought forward and carefully reviewed, with the conclusion "that iodol and its compounds have an undoubted value as therapeutic agents, and have obtained a permanent place in practical medication." I have gone into the use and history of this drug thus extensively because, although I have several times called attention to its value in years past, the dental profession has not seemed to take it up. I use it constantly as a topical application in all forms of stomatitis and pyorrhea. As a mouth-wash—one-half grain to the ounce—it allays inflammation, stops suppuration, and hastens granulation. In severe cases of pyorrhea I inject it into the pockets, and if the gums are much swollen and tumefied I use it hypodermically as well, and at the same time prescribe it as a mouth-wash for home use.

The sozo-iodol and zinc is my favorite form. I also use it as an ointment for packing pyorrhea pockets. If its application is painful, add a few grains of acetate of morphia to the ounce, as follows :

℞—Sozo-iodol and zinc, gr. viii ;
Morph. acetatis, gr. ij ;
Lanolin, ℥j.—M.
*Sig.*—Use as a topical application in pockets.

Where a decided escharotic action is desired in chronic cases, trichloracetic acid (twenty per cent.) will be found useful, and will produce less inflammation than the same strength solution of nitrate of silver. The indications for its use are a considerable degree of tumefaction with a tendency to eversion of the free margins of the gums, due to excessive granulation. In some cases it is necessary to precede its application by a ten per cent. cocain solution. The same results may be obtained by applying a ten per cent. solution of chromic acid, and I believe that it will be found preferable to trichloracetic acid, being fully as efficacious and much less painful.

Robin recently presented a new combination of iodin, under the title of "iodozone," which he claims is a powerful antiseptic, and which has been employed successfully as an oral antiseptic. It is said to be a white liquid with all the good and few of the bad qualities of iodin, being less irritating and caustic in its effects. Although I have not been able to procure any of it for practical use, I look so favorably upon all the preparations of iodin that I have no hesitancy in recommending it on the results claimed for it by its discoverer.

Dr. Black advocates the use of oil of cinnamon and carbolic acid as follows :

Oil cinnamon, 1 part ;
Carbolic acid (crystals), 2 parts ;
Oil gaultheria, 3 parts.

Syringe pockets once in four days, full strength. He further recommends for an after-treatment, after parts have shown a tendency to heal, a mouth-wash to be used by patients,—the 1-2-3 mixture just described, diluted one-half with anise oil or oil of lemon, on a brush. He also recommends eugenol and bichlorid of mercury. The latter is objectionable as a permanent mouth-wash because of its poisonous qualities and its action on the teeth. Creolin has been advocated by some. The main objection to its use in the mouth is the bad odor produced by it when brought into contact with pus in any quantity. Camphoric acid has of late years been used in the treatment of purulent conditions with marked success, and seems to be specially indicated in pyorrhea alveolaris as a mouth-wash in the strength of one-half grain to the ounce of distilled water or peppermint water. It may be used in one per cent. solution in pockets.

Dr. T. L. Gilmer first called my attention to phenol-camphor in chronic cases as useful. I have found it so, but have laid it aside for sozo-iodol and zinc.

Lysol may be used, five per cent. solution, for syringing out pockets, but is hardly suited for use as a mouth-wash. It is perfectly innocuous, and has almost a specific action on suppuration. It is slightly stimulant in a one per cent. solution, but not irritant, and for this reason hastens granulation. It gives a peculiar soapy feel to the tissues.

Among the latest remedies propounded, asepsin has a very high place, and may be used as an aqueous solution, or as a spray in the form of the following mixture:

℞—Pomade of juniper, ℥j;
Asepsin, gr. iij.

Acidum asepticum has much the same property as $H_2O_2$. It is a bor-cresol hydrogen peroxid, and when diluted with water to the strength of ten per cent. forms a most useful wash. When brought into contact with pus or blood, free oxygen is formed in considerable quantities, to which it undoubtedly owes its antiseptic properties. It has a slight odor and caustic taste, and no doubt will find a place in the dental pharmacopeia.

I also desire to call attention in this connection to sulfite of zinc, styrocol, and sulfonal as probably remedies that may be found useful in the treatment of pyorrhea.

*Constitutional complications.*—Where it is suspected that some complication exists, it is always best to treat the case in consultation with the family physician. In most cases the patient will be referred to you by the medical practitioner to attend to the oral trouble, in which case he will have already made the diagnosis of the constitutional disease.

The most common to present is rheumatism. At the present writing I have a patient under treatment who has a recurrence of pyorrhea alveolaris every time she has an attack of rheumatism, and while she derives some degree of relief from the constitutional treatment received at the hands of her physician, yet she almost invariably reports to the clinic for dental treatment before she is fully cured. On the other hand, local treatment when applied first affords little or no relief, and resort has invariably to be had to constitutional remedies. These are in the nature of alkalies to reduce the high degree of acidity present in the fluids of the body, coupled with some drug that will act to remove the morbid processes already established. This treatment is based upon the theory that there is an excess of acid (probably lactic) in the blood, and the satisfactory results derived from the use of an antacid seem to conclusively prove the correctness of the theory. Then if our theory, that the local inflammation of the peridental tissues is due to lactic acid, is correct, the fact that pyorrhea alveolaris is found in connection with rheumatism also indicates that the lactic-acid theory of rheumatism is the correct one, and explains the close association of the two diseases, and the two theories support each other. Tartarlithine is spoken of very highly by a number of my acquaintances as almost a specific in the treatment of rheumatism and rheumatoid gout.

In connection with the constitutional treatment and in addition to the ordinary mechanical and antiseptic treatment which has been advocated earlier in this paper, I have to present the use of a new drug, *asaprol*, a mono-sulfate of naphthol, which according to Stackler is neutral in its reaction and readily soluble in alcohol and water, and is not altered by heat. It is non-irritant, only slightly toxic, and well borne by the digestive tract. It is asserted to be a good germicide, arresting the development of, among others, the Streptococcus aureus and the Pyocyanine bacillus, both of which have been accredited the rôle of causing rheumatism. In addition to its internal use, it is especially indicated for hypodermic injection into the gums in cases where they are highly congested and painful neuralgic complications are presented. It is an analgesic, and will control the neuralgia and overcome the local suppuration.

Solutions of the strength of from two to five per cent. may be used as a mouth-wash, and the pockets may be packed with a paste of lanolin and asaprol, using three parts of the former to one of the latter. In the treatment of gout or the gouty diathesis, where it is found as a complication of pyorrhea alveolaris, many things must be borne in mind.

The most prominent feature in such cases is neuralgia, which may be relieved by some one of the many forms of analgesics. One that has been very efficient in my hands, and which is not generally used, is gelsemium, which if given in twenty-minim doses every half-hour for three doses has never failed to give relief.

For constitutional treatment, nothing has superseded colchicum as a specific. To control the paroxysms, acetated tincture of opium may be combined with wine of colchicum root in the proportion of one of the former to two parts of the latter, and administered in from twenty to thirty-minim doses, repeated every hour until relief is obtained. In some cases the opium is rejected by the stomach. In such cases substitute bromide of lithium for the opiate. The gums over the affected roots should be painted with the dental tincture of iodin or with the following:

℞—Potass. iodidi, ʒss;
Potass. bicarbonatis, ℥ss;
Aq. bullientis, ℥viij;
Tinc. opii, fʒj—M.

*Sig.*—Apply on small rolls of cotton, and place oiled silk next cheek.

Prescribe lithia water, and restrict the diet to farinaceous food, milk, and white meats. A tonic laxative may be substituted for the lithia water if there is indigestion. The patient should get as much outdoor exercise as possible, and the same lines of treatment adopted for the local disease as have been indicated for ordinary cases of pyorrhea alveolaris.

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# ABSCESS OF THE ANTRUM OF HIGHMORE.

BY E. S. HODGSKIN, M.D., BROOKLYN, N. Y.

(Read before the Second District Dental Society of the State of New York, November 12, 1894.)

THE causes of inflammation and suppuration in this thin-walled cavity, so well adapted to the growth and propagation of pathogenic germs, are not numerous. They are set down in various text-books as irritation from the root of a carious tooth, traumatism, spreading of inflammation from the nose, necrosis of the alveolus caused by syphilis, phosphorus poisoning or traumatism, and polypi or other tumors in the nasal cavity. By far the greatest number of cases come from the teeth, and in fact many observers claim never to have seen it result from any other cause. It is not a frequent affection, which when we bear in mind the close connection of the antrum with the cavities and sinuses in this region is strange. For that reason it behooves us all to bear in mind the possibility of its occurring whenever we see signs of inflammation in this region.

The importance of this suggestion is emphasized by the treatment of a case which I saw in my surgical clinic at the Southern Dispensary some weeks ago. The diagnosis of facial abscess had been made by one of those fortunate men who bear both the titles of M.D. and D.D.S., and knowing neither profession, practice both. I say knowing neither, because I believe it is impossible for a man to work in two professions, both of which require so much study, and keep up in either. The face was lanced, and, as a result, the girl will bear through life a cicatrix, as disfiguring as it was unnecessary.

The symptom to which your attention will first be called is deep-seated pain, constant and radiating. In association with this there is swelling of the soft parts, sometimes very great œdema, heat. redness of the cheek and lower eyelid. The thinning of the bone gives rise to a parchment-like feeling. On percussion there is dullness and tenderness on the inflamed side, and we have the temperature and general feeling of depression associated with the formation of pus, which, when formed, if the nasal opening of the antrum is patulous, can be seen flowing anteriorly into the nose or posteriorly into the pharynx. These are the general symptoms in acute cases. When the inflammation has become chronic the picture is different, and the following case, for the notes of which I am indebted to Dr. J. P. Geran, of this city, presents it very well.

A physician, having diagnosed his own case, traveled from one place to another trying to get rid of malaria, finding in each new place better health, and thinking at last he had found the climate best suited to his needs. In a short time, however, he went back to his previous ill condition. He suffered from constant headache, lost weight and strength, and had a fairly constant temperature of 100° F., with frequent chills. In fact, he presented a picture of chronic septic poisoning, which was caused by the absorption of the decomposing discharges held in the antrum, because there was no outlet. The dentist noticed that one side of his face was slightly larger than the other, and on examining his teeth found the first molar gone with the exception of two roots. These were extracted, and a small probe was passed into the antrum. On withdrawing it the stench was so great that the office windows had to be opened and the room thoroughly aired.

The diagnosis in acute cases is not difficult, if we pay attention to the symptoms. If the inflammation is caused by a carious tooth, tapping the teeth with a steel instrument on the diseased side, we find one which gives out a sound duller than the others. It will also be altered in color, losing its bright, shiny appearance. In chronic cases the differential diagnosis is made between cysts, which are usually dentigerous, being due to an error in the development of the enamel-sac, most frequently of the permanent teeth, and tumors either malignant or innocent. With both tumors and cysts, the swelling is continuous and increasing. There is no history of an inflamed tooth, and unless the tumor is malignant, the constitutional symptoms are very slight. In malign tumors we have the family history and the cachexia to enable us to differentiate.

In doubtful cases, caused by a tooth, I would recommend a consultation with a practical dentist, because, as a rule, he has seen more cases of pus in the antrum due to teeth than we have. It is very doubtful if the electric light in the mouth is any aid in making the diagnosis. Before the pus has formed, the usual means of aborting it may be tried by using cold and abstracting blood locally. Later the treatment, either in acute or chronic cases, consists in doing only two things, and doing them well,—namely, drainage and antiseptic douches. As in the greatest number of cases the cause is a carious tooth, extracting it gives us the readiest means of obtaining the former. If a root has not penetrated the floor, it is very easy to make an opening with a small gouge or a dental drill. If the teeth are sound, the antrum can be entered at the point of election, which is from the canine fossa on a line with the second bicuspid, about an inch above the gums, and a counter-opening made into the inferior meatus of the nose, on a level with the floor of the antrum. This permits of drainage through both nose and mouth. No matter which opening you are compelled to make, it is very important to keep it open, and for this purpose cotton, gauze, or a tube can be used. Rubber tubing answers all purposes, and has the advantage of economy. I don't think the gold or silver tubes are any better, even in patients where expense is not taken into consideration, and I hope to show later that the rubber can be used as easily as the metal.

In the few cases I have seen, the great trouble has been to keep anything in the way of a drain in place. I found that the gauze or cotton always worked out shortly after the patient left me. In the last one I saw the first molar had been extracted, and the pus was flowing very freely. I made a trial of iodoform gauze as a drain, but had to abandon it after using it a few times. Then I used a rubber tube, which I kept in place in the following manner. A piece of small caliber was divided longitudinally for about half an inch. A thread was then tied to the end of each of the arms thus made, passed through holes in the side of the tube, and drawn through the lumen tightly enough to extend the arms, leaving a T-shaped affair. The arms were bent back, and the tube being held in a right-angled forceps, it was easily passed through the sinus into the cavity. On withdrawing the forceps, the arms opened and held the tube in place, without the trouble and annoyance of any more mechanical apparatus.

If the teeth anterior and posterior are sound, the tube can be tied to them, and this other procedure will not be necessary.

In all the long list of antiseptics nothing else answers so well as the peroxid of hydrogen, in full strength; but just here let me remind you of the possibility of generating so much gas, when the pus is plentiful, as to cause your patient much pain and perhaps harm by the distension. This can be avoided if the pus in the cavity is first washed out with distilled water. The peroxid can be readily thrown into the antrum by a dental syringe, the nozzle of which is bent at a right angle, and should be used in quantities of half an ounce every day. This is the treatment I followed in the case I referred to, and in five days the peroxid came out clear. I then withdrew the tube, and saw the patient in two days, when it was almost impossible to pass a probe into the cavity. Dr. Geran's case, to which I have referred, was cured by him with solutions of carbolic acid, and I suppose it is a mere matter of selection which antiseptic you use.

Sometimes superficial granulations form, which are best removed by a sharp curette. With this constant discharge of pus the odor of the breath is of course very disagreeable, and correction is important, relieving the patient of a very distressing symptom. Again you are met with the same long array of antiseptics and deodorants. Peroxid fulfills all the indications, but I prefer permanganate of potash, the only objection to which is that it stains the tissues; but this wears away so quickly, after its use is stopped, that it should not interfere with its being selected. A solution of gr. ii. to ℥ i. is strong enough, and the frequency of its use should be determined by the amount of pus present.

In closing, allow me to emphasize the absolute importance of the strict aseptic condition of your hands, and of the instruments you may use. There is already an area prolific in germs, and your aim is to prevent, rather than increase, their number. Also to impress on your minds the necessity of an early operation, and the uselessness of continuing your abortive treatment for any length of time, as the disease may gain such headway as to make the cure more difficult, and turn a comparatively simple case into a very severe matter.

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# DENTAL THERAPEUTICS.

BY L. ASHLEY FAUGHT, D.D.S., PHILADELPHIA, PA.

(Read before the First District Dental Society, State of New York, December 4, 1894.)

If there is one fact regarding dentistry more true than any other, it is that to-day it is the most progressive of all the professions.

Its strides in development are the constant remark of the thinking portion of the laity. If there is one point more prominent in this development than any other, it is in the line of dental therapeutics, both local and systemic. The dental practitioner of the present era is forced to a large and ever-increasing knowledge of medicaments and their uses, and he who essays to stand in his office as a dentist without such knowledge is not capable of giving to his patients the intelligent aid that the care of their cases demands. In proof that this is not mere fiction or sentiment, I wish to state that a careful count of the pages in our journal literature will show that this year nearly one-fourth of the space is occupied by a consideration of medicaments and their application to dental diseases, a fact which receives strong accentuation when placed in contrast with an equally careful count made of the same exponent of the profession in any one year twenty years ago. The proportion then was barely one-thirteenth.

In the clear light of this statement, it is impossible to understand how members of the profession can say, as I have heard them say time and again, and especially during this summer, while in attendance upon the sessions of the American Dental Association, that though for many years they had not been in attendance upon society meetings, they would not know that they had been absent. They found things about as they left them, and could join right in the discussions as though they had been ever present. The caravan was moving on in the same old ruts in which they left it. The truth, gentlemen, is that they could not do so—the possibility is that they did not know that they could not.

I hazard little in saying that as a rule the men who do not attend our monthly and yearly assemblings do not take nor read closely our journal literature, and it is high time that such idle boasting shall cease. The great trouble with our profession to-day is that the large majority of those in active practice are not close students. I am sure that many of you here to-night, who are of the little band who have made dentistry a profession and given to these stay-aways those possibilities of which they would have the public think they are a part, have been pained when visiting their homes to witness the utter lack of text-books and journals ; yet such is the sad condition of many—alas ! too many—of those who with us direct the trend of the public estimation of dentistry. They ought to blush at any one thinking of them as specialists in medicine, as others blush to think that they are dentists.

I do not wish to be understood as decrying the full development of the other three-fourths of dentistry, or as undervaluing that which concerns our daily duties in repairing the ravages of dental disease, but I wish to keep clearly in mind that higher duty, the prevention of this manifestation of disease, and the alleviation of suffering. In the comprehension of this lies the mark of professional life, and our studies will touch the domain of therapeutics. The derivation of that word is an inspiration,—*θεραπευω*—I take care of, or cure. Not necessarily by the application of drugs, or by the use of medicaments, but in large part, and in first part, by a wise invoking and direction of the "vis medicatrix naturæ." Too many of those working in the domain of therapeutics fail to grasp that disease-manifestations are simply due to violation of the laws of life and health, and in proportion to the violation of law which they express ; and that, instead of prescribing drugs to mend a broken or perverted law, much more beneficent results would soon be apparent by expending the same effort in better food, better exercise, more rational dwellings, and better clothing ; or, in other words, in obeying and supporting, instead of violating, the laws of life and health. My mind at this moment, as it has time and again, reverts to an enunciation made in 1872 by Jacob L. Williams, of Boston, Mass., in speaking of "the influence of the nervous system on the health of the teeth and mouth." Allow me to quote it:

"My conclusions are that where the nervous power is *not* unduly active or overdrawn, as a rule, the digestive system will be in such condition that the general character of the secretions of the mouth will be alkaline and corrective of acidity, the most common cause of destruction of the teeth. And, on the other hand, that where the nervous system *is* unduly active or its powers overtaxed for a length of time, we may expect to find the fluids of the mouth tending to an acid character, in proportion to such overdraft. In general terms, then, the result of these observations has been to prove (other things being equal) that so far as tranquillity of nerve prevails, so far we may expect soundness of the teeth, and in proportion as the restless condition exists in continuance, in that degree will there be disease in the mouth."

In this statement is a primal principle of utmost importance. Hardly a patient in our clientele to-day—of those most needing our care—is an exception to this rule. The life of the American populace is a constant manifestation of the "restless condition in continuance," and therapeutic treatment must begin in restoration of "tranquillity of nerve." So myriad are the forms that the task is herculean. The patients which present to us to-day are hot-house plants,—plus an enormous hot-house heredity. They come to us with nervous systems producing disease, and at the same time, in a similar ratio, not only unfitted to bear the most kindly ministrations at our hands, but also unable to assist those efforts, however nobly put forth for their recovery. The gospel of fresh air, sunshine, and out-door exercise is the sermon that must be continually upon our tongues. Our first prescription must universally be—

℞—Sleep, 12 hrs.;
Out-door exercise, 1 hr.;
Diet, q. s.
*Sig.*—Take once in every 24 hrs.

We could with profit consider the nature of these ingredients, for, strange to say, but few persons either sleep, exercise, or eat correctly; but the time does not permit the incorporation in this paper of my own studies regarding them. Perhaps, in the discussion, others present may bring out the question of electric polarity during sleep, of the proper way in which to exercise, and of the great benefit of abstemiousness in diet. I leave that and the allied mechanical, physical, dietetic, and hygienic agents to them, and to your own reflections on the subjects, and now enter upon that portion of my topic which involves the exhibition in daily practice of pharmaceutical agents.

In dentistry, as in general medicine, their name is legion, both for local application and for systemic use. It is, fortunately, as impossible as it would be unprofitable to turn our offices into drug-shops and use them all. We must specialize here as elsewhere. Setting clearly in mind the objects which we are desirous to attain, careful experimentation and study will soon indicate a perfect line of remedies for any practitioner's use, and mature experience in their exhibition will often count in obtaining therapeutic result for as much as the drugs themselves. Intelligent selection of remedy plus proper and careful use equals therapeutic result. It will be only wise to vary such settled practice when indications strongly point the necessity for so doing, or that a decided possible advantage is to be gained; but as such conditions will not infrequently occur, we need not fear we shall become too conservative or lack in making scientific advancement.

These remarks will be found not only to be true as applied to topical remedies, but very highly true as we make exhibition of systemic remedies for dental diseases. In a paper on this subject which appears in the December issue of the DENTAL COSMOS, I have outlined a list of such remedies,—some thirty-one in number,—as constituting a basis for such practice, and appended remarks indicating special uses of a few. To-night I may consider a few more.

It being admitted that most of our therapeutic efforts must touch the question of restoration of "tranquillity of nerve," how shall we best, besides meeting the wear and tear and supplying necessary materials with which to build up the system, relieve the tension imposed by faulty diet? The answer to this question lies in the recognition that correct feeding involves not only correct sources of food-supply, but absolutely demands a control of assimilation and elimination. Careful study has enabled me to know that in the direction of the liver and kidneys lies the more profitable consideration, and the interest in both these organs centers around the production and elimination of urea. My remarks now relate only to the uric-acid solvent.

I have grown more and more to confine my treatment to the use of ammonia salicylate, rarely using the sodium salicylate, and absolutely giving up the use of lithia carbonate, which is so often prescribed by physicians. This is because I am at last convinced that it possesses no utility. Charles W. Folkard, in a recent number of the *Chemical News*, pointed out this old but flourishing blunder in medical chemistry, and, in addition to presenting other reasons for stigmatizing its use as "an erroneous assumption," says "the chemist knows that the tendency is toward the formation of the more insoluble, not of the more soluble, compounds; and that for lithia to be of any service in avoiding deposition of urates in the joints or bladder, all bases which form compounds with uric acid of less solubility than lithic urate (potassium, sodium, ammonium) must be absent. It would be extremely convenient, as regards uric-acid patients, if lithia water could be made to act in this way, but the laws of chemical combination do not admit it." While thus setting aside an old remedy, I have lately substituted for it the use of piperazin, and am led to believe with good results. It is not only much more soluble than lithia carbonate, but it will dissolve twelve times more uric acid. The dose used is about eight grains internally up to a maximum of about twenty-five grains daily. So much for ridding the system of uric acid, that great disturber of "tranquillity of nerve." Now a few words relating to the other avenue—torpidity in the action of the liver—and resultant constipation. The word constipate is defined by Richardson: "To compress, to condense, to thicken, to cram or squeeze close, to close up or stop up." This gives a clear idea of the condition; but to relieve the state we must take into consideration the causes of the condition. These are often complex, but for the purposes of our study we want the most common proximate cause. Let us reason together for it. The food and drink taken into the stomach make a thick fluid mixture. As this is pushed along the intestinal tract, the nutritive matters are absorbed in a fluid state. This removes the water in large quantities, yet leaving sufficient under healthy conditions to keep the contents of the tract pultaceous until the residue is voided in a soft, solid condition,—no constipation; but when from any cause there is an unusual loss of water, the residue will reach the colon in a compressed and condensed condition,—a condition of constipation. The more rapidly, therefore, the contents are carried along the tube, the less time will there be for the extraction of water; and thought about this suggests the prime cause of constipation, slow or defective peristaltic action, torpidity in liver-action. Our medicaments must therefore be corrective of the action of this organ as well as aperient in their effects. Senna, rhubarb, aloes are naturally thought of, but my own experience has shown that the most universal and most happy effect is to be obtained by the use of cascara sagrada, and three or four glasses of water more than is customary in each twenty-four hours. The cascara used is that of Parke, Davis & Co.'s maltine with cascara sagrada, given in doses of a teaspoonful daily.

The limited time at my disposal has only permitted me to outline what I consider as the basis of dental therapeutics,—a comprehension that dental diseases are mainly due to impaired nerve-tranquillity, to be restored by true hygienic living, judiciously aided by therapeutic remedies directed toward the organs of excretion; but if what I have been enabled to say shall fix the minds of a few upon it as upon a compass, the needle will point true upon any other course you as individuals may desire to sail over, and our hour will have been more profitably spent than in desultory discussion of many medicaments.*

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* Since the foregoing paper was read, my attention has been arrested by the following statement, which I quote from Alexander Haig's "Uric Acid in the Causation of Disease."—L. A. F.

"I found that it had been pointed out in a work on chemistry by Rose ('Chemical Analysis,' p. 15) that lithia given by the mouth was no use as a solvent of uric acid, because it 'forms a nearly insoluble triple phosphate with phosphate of soda, or with the triple phosphates of ammonia and soda,—salts generally present in animal fluids.'

"Here, then, was a simple explanation: the lithia I took by mouth did not cause a plus excretion of uric acid because it never got to the uric acid, being waylaid by the phosphates and triple phosphates above mentioned. This would explain its not causing a plus excretion of uric acid; but why does it cause a minus excretion or retention? The answer is again simple, and it was in the first instance suggested to me by Mr. J. E. Saul, F.I.C. I have mentioned before that phosphate of soda is a good solvent of uric acid, and in presence of alkali increases its excretion; now, phosphate of soda is a normal constituent of the blood, and is generally there in presence of alkali,—*i.e.*, in a condition to act as a solvent of uric acid,—so that the lithia in forming, as we are told, an insoluble compound (well known to chemists) with the above phosphates, removes from the blood one of the natural solvents of uric acid; and we now see not only why lithia causes no plus excretion of uric acid, but why it causes retention; and there is here no exception whatever to my law of solubilities.

"'In the test-tube lithia is said to be a beautiful solvent of uric acid, but in the body its chemical combinations with phosphates not only prevent its action on uric acid, but put out of use a certain amount of phosphate also.'"

# PROCEEDINGS OF SOCIETIES.

## NEW JERSEY STATE DENTAL SOCIETY.

(Continued from page 996, vol. xxxvi.)

### SECOND DAY—*Morning Session.*

THE PRESIDENT. The paper to be read this morning will be by Dr. M. H. Cryer, of Philadelphia; subject, "Facial Neuralgia, from a Dento-Surgical Standpoint."*

During the reading of his paper Dr. Cryer illustrated the working of the surgical engine in cutting bone, and said, "I wish to say here that the man who deserves the credit for bringing out the surgical engine is Dr. Bonwill, a dentist. This instrument is only a modification, perhaps an improvement, of his engine."

DR. J. FOSTER FLAGG. Mr. President, I don't care to speak on the subject, but I would like to say that it seems to me that the paper is another illustration of the value which certainly is attached to special work by special men. It seems to me that almost every visit I make to you gentlemen develops more clearly the fact that we dentists are working in divers directions. We each seem to have our hobby, and the paper is an illustration of the indefatigable energy of individual dentists. We can trace our profession in our individual lives; it is only the aggregate of individual dexterity and ingenuity which has made us, as it is called on the cover of the COSMOS, *the* profession.

DR. JAMES TRUMAN. Mr. President, I would like to express my very great gratification in listening to this paper. I have not heard anything for a long time that so profoundly interested me, or that so clearly demonstrated the whole subject. I know it is a common thing to say that the paper is good; but this is a thoroughly scientific work, by a specialist in our profession, and I am proud of it. It is not a paper to be discussed; we are not able, certainly I am not able, to talk upon it in a critical way, but I am very glad to have been here and to have listened to it. I heard something, a few days ago, in regard to this very extraordinary case that Dr. Cryer has described, that I would like to have him explain. I was told that the man upon whom the operation was performed died recently, and I was highly gratified to learn from Dr. Cryer's remarks that he was still living and moving about. I don't understand how such a rumor or statement got abroad, but I was informed that the man had died of blood-poisoning. Whether another patient, operated upon in a similar way, has died of blood-poisoning, I don't know; but I would like to have that matter settled right here by Dr. Cryer explaining how the rumor got abroad.

DR. CRYER. The case is just as I have described. The man is alive, well and hearty, and ready for work. That operation was done last October. I think the way the report got out that Dr. Truman speaks of is this: Professor Keen has performed that operation three times in the last six months; one case was an aged lady nearly seventy years old, who had suffered a great deal, had many operations performed, and was in a very low condition. The operation required considerable time, and just as the ganglion was destroyed the artery that comes through the foramen spinosa was cut, just at the foramen. Now, as you know, to ligate an artery in the flesh is one thing, and to ligate one inside of a bony structure is another thing. Professor Keen plugged it the best he could, and the patient got along very well for several days, but finally died.

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* See page 24, DENTAL COSMOS for January.

On motion, the paper was passed.

The PRESIDENT. Dr. C. N. Johnson, of Chicago, will read a paper on "The Management of Pulpless Teeth."*

### *Discussion.*

Dr. PEIRCE. Mr. President, your committee asked me to respond to this paper, but I have little or nothing to say in addition to what you have heard on the subject of the devitalization of pulps. I may make a little criticism upon some of the statements. First, a word in regard to the devitalization of pulps. The statements made by the author of the paper I fully concur in, so far as the material and the length of time are concerned; but cobalt is not a new material. The Spooners, who first devitalized pulps in this country, made use of cobalt and arsenic. Every housewife knows what flystone is. The cry against the Spooners was that they were using flystone in the mouth; so cobalt was the first material used in this country for devitalizing pulps. The compound is used to avoid getting too much arsenic in the tooth, and the consequent liability of injuring the tissues around the tooth.

With regard to the time it is to be left in a tooth, I have placed it in a cavity, sealed it up, and sent the patient away for a month. It will devitalize the pulp, the material will work for two weeks or a month, and there will be no discomfort after the first day, if there is in that time; but the patient should come back within a month, which would be previous to decomposition of the pulp in the majority of cases. The object is simply to give time for the prolongations of the pulp which enter the tubuli of the tooth to slough, so that when the patient returns the pulp may be removed without tearing it to pieces, which is an advantage. It is a practice I always have pursued, and it is one by which you can remove the pulp without tearing it into small shreds, and leaving portions of them remaining in the tubuli, necessitating further treatment.

In reference to enlarging the canals of roots, I am opposed to the use of the drill in the canals of the roots of teeth. Very few persons can use a drill dextrously enough to enlarge a root-canal without endangering the lateral walls, and possibly going through them into the cementum and wounding the pericemental membrane. The paper we had last evening gave us a most admirable method of enlarging and clearing out those canals,—that was, with acid. It can be done in that way without injury to the surrounding tissues, and done successfully, and I think it is far preferable to the drill for enlarging canals, whether they are straight or curved. If they are curved, it is almost impossible to drill into them without unfortunate results.

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* For Dr. Johnson's paper see page 959, DENTAL COSMOS, December, 1894.

In regard to the treatment of teeth that we term pulpless teeth, he has given us a method of treating them which no doubt has been successful. It is only a question of which method is most successful, which of the methods presented to us will do the work most satisfactorily. Antiseptics placed in a cavity will in time purify the cavity and canals so that they may be filled with assurance of success. The question is, Which is the most efficient? I should prefer sulfuric acid to any other antiseptic. It is powerful in its action in destroying organic matter. The fear that was expressed, that the introduction of soda bicarbonate after the acid, and the resulting fermentation, would cause trouble, is, I think, groundless. I have no fear of that. If a little were forced through the foramen it might cause a little temporary disturbance, nothing more. In the case of a cavity which had contained a dead pulp for days or weeks, and in probing you forced a little down through the apical end of the canal, you would undoubtedly have some disturbance. That is to be avoided. The great danger to be avoided is the careless probing of canals which are loaded with decomposed material. If that decomposed material be forced through the apical end of the canal you will have disturbance, provided there is no fistulous opening already established. I think the acid antiseptic destroys the poisonous organic material, and if the acid does go through the apical end it carries with it the remedy, because it has already destroyed the poisonous condition, therefore it may penetrate the tissues without doing any damage whatever. The most it would do would be a temporary disturbance.

When the gentleman spoke of that dreadful thing, placing cotton in a root-canal, he was applauded by some of my friends quite vigorously. Gentlemen, I have taken out cotton fillings that had been put in by Dr. Flagg thirty years before.

Dr. FLAGG. Oh, my friend!

DR. PEIRCE. Yes, and found them as pure as any filling I ever removed from a canal. While I am not in the habit of filling canals with cotton alone, I will say that if gentlemen will take a bit of cotton and a little aristol, moistened with chloroform, and pack it carefully in a root-canal, they will have a filling that will protect it as well as any other material they can place there; or use a little iodoform. Fifteen years ago I filled a canal with cotton and iodoform, pushing it up to the apical end, packing it from the apical end to the crown cavity; I opened that root on Saturday last, and it was impossible to find any moisture, or any odor except that of iodoform. The cotton was dry and pure, and the canal, when I took out the filling, was as pure a canal as it was possible to have, and that cotton had been in position fifteen years. Since aristol has been in use I prefer it, because it is less offensive to the patient than iodoform. Iodoform is said not to be as good an antiseptic as some other materials that are used now; still it has done good, and I feel satisfied that cotton and iodoform, well packed into a root-canal, will protect it. So I think cotton is not such a dreadful thing to put in a root-canal. Of course I would not put ordinary cotton into a canal where there was moisture coming in from the apical end; I would first saturate the cotton with some antiseptic that would prevent it from becoming impure. Gutta-percha, or chloro-percha, makes an admirable root-filling; but whatever I use, whether chloro-percha or gutta-percha, I am in the habit of filling the end of the canal with cotton and some good antiseptic, as iodoform or aristol, first pressing up the cotton, and then filling afterward with the gutta-percha. That makes a good filling. Any one following out the directions given in the paper would perform good operations. The gentleman has gone over the whole subject, and given us a *résumé* of practice that if carefully followed will lead to good results. But it is not worth while to throw censure upon a different practice when that practice also leads to good results.

Dr. HAYHURST. Mr. President, a man must always work according to the light that is given him. I may possibly be considered, in what I have to say, among my generation, an old fogy. This is a subject, however, in which every dentist is more or less concerned; and I have no doubt that, with the clear understanding that the writer of the paper has had of the matter, and the careful observations and investigations that he has made, it has not all been clear sailing with him, but that he has had trouble and vexation with these cases of pulpless teeth. He advocated the application of cobalt instead of arsenic, and for the reason that the cobalt was not so active as a combination of arsenious acid. Now I don't consider that point well taken. I would advocate arsenic; not pure arsenious acid, but in a combination. We were taught, in my student days, that a preparation with which to destroy or devitalize a pulp should be equal parts by weight of arsenic and sulfate of morphia, triturated with creasote until the materials were ground to an impalpable powder and entirely incorporated together. I tried that, but I found that notwithstanding all the grinding I could possibly give, the materials would separate. The arsenious acid was so much heavier than the other materials that it would settle, the mass would become of unequal strength, and, of course, unequal in its operation; so I abandoned it in that shape. I tried using the materials dry, so that the particles of arsenious acid and morphia would not separate and become of unequal strength; using it with creasote, or with some of the essential oils, as oil of cloves, moistening a pledget of cotton with the essential oil, and placing it in the cavity. The use of it was severely criticised, especially in the secular papers, on account of some bad results; but such agents must be used with judgment. If there is not sufficient of the drug it will be inoperative, and if there is too much it will be injurious; so the greatest care and judgment are required in their application. I learned, from painful experience in the use of agents to devitalize the pulp, that nothing should be placed directly upon this trembling, vital little thread, or else it would give great pain. I have had patients come back to me, in the earlier days of my practice, suffering the most agonizing, excruciating pain. From that I learned that there should be no pressure upon the pulp in the application of this material, and great care was used to prevent such pressure. In preparing a cavity, I never thought it was very important that the pulp should be extracted down to the very root. I don't know what you may think of that, but I never thought it was necessary to remove all the pulp, but only as nearly as it could be conveniently done, and the filling I used in filling roots was oxyphosphate of zinc, and then filled the cavity with gold. Sometimes the operation could be done at one sitting, in other cases more time was required.

I must commend the paper; and whether it was right or wrong, it does great credit to the writer to have written such a paper on a subject which everybody endeavors to criticise.

Dr. WILLIAM H. TRUEMAN. Mr. President, the paper just read impressed me as being a very solid presentment of the case. I was particularly pleased with it from the fact that it was very explicit and very practical. Every word had its meaning, and every word told. In that respect it is a model paper for presentation to an association like this. As I said last night, there is in this subject a great deal of personal equation.

I would suggest that oil of cajuput is an exceedingly good lubricant when filling with gutta-percha. It was suggested by Dr. McQuillen, I think, at a meeting of the American Association, about 1881. I have been using it for several years, and have found it very satisfactory. It is a non-irritant, answers the purpose very well, and in my judgment has no more objections than chloroform.

In regard to the action of arsenic and cobalt, I have been using arsenic for a great many years, and I have very rarely found a patient complaining of its causing pain. There are some cases where pain will follow its use, but as to the application of arsenic being the cause of it, I think that is comparatively rare. I have used it for years, simply grinding up the arsenic with creasote and a little glycerol. After a while it settles down to a paste, and you can easily take up the small portion required and apply it, with a little pledget of cotton and a little creasote. Sometimes I use cocain; whether it does any good or not, I don't know. It is very hard to tell whether cocain is really of any benefit or not.

Another point in regard to the application of arsenic. I notice that a number of writers lay particular stress upon the use of an exceedingly minute portion, so as not to cause too much irritation; and another point made is that it should not pass beyond the apex of the tooth. Is that scientific? How does that comport with our accepted ideas about its use by empirics as an escharotic for the removal of tumors and cancers? In such cases a large amount is placed upon a denuded surface, and, provided enough is used, there is comparatively little risk attending its use; but if a small quantity is used, the probability is that the coroner will have something to say about it. Now, does not the same rule apply in its use upon the pulp? I use quite a large amount, probably a hundred times as much as is needed, and I don't use it as a compound. My impression is that when it has devitalized the tissue, it is not absorbed by the devitalized tissue, but only by living tissue. If that is true, there is no risk of its passing beyond the apex of the root in ordinary cases. I would call your attention to a suggestion made by Dr. E. C. Kirk, to mix the arsenic with Robinson's remedy, his idea being that it is made more soluble thereby, and acts more efficiently. With that I have no personal experience.

In closing, let me call attention to a remark recently made by that intellectual giant of Berlin, Dr. Miller, in regard to the subject. He said, substantially, that for patients of unlimited means and unlimited time he could do better work than he could for another class of patients whose time and means were limited. It may be all right to take an hour and a half to thoroughly cleanse out a pulp-canal for one patient, and we may do the very best service we can, while with another patient another operator may find he has limited time. I think the essayist brought that point out. We should conserve our patient's strength, making the operation as thorough as possible, while at the same time making it as easy as possible for both operator and patient.

Dr. WATKINS. Mr. President, I have a few words to say upon the paper before us. I think our profession would be much improved if we had more papers written in a similar manner to this one. I think one great deficiency in all our papers is that they are not comprehensive enough. If we follow in our practice the suggestions of that paper we will certainly do as good work as we have been doing, and perhaps better. The minute description of the way to destroy a pulp, how to place the material in the cavity, and how to secure it there, I have never heard before. I have attended a great many dental meetings, and heard a great many papers read, yet I have never heard a description like that, or anything approaching it in completeness. I was very much pleased also with his description of his method of finding the small canals and enlarging the openings by evaporating alcohol in the cavity. That was a new idea, and something that I think I will try.

In regard to Dr. Trueman's statement as to the quantity of arsenic to be applied, I take just the opposite ground. He puts a large quantity of arsenic in the cavity so that he will not destroy the pulp beyond the apical foramen; I put in a small quantity of arsenic so that I will destroy it that far. That is where my difficulty lies, in not being able to destroy it all the way to the apical foramen.

Dr. MAXFIELD. I was very much pleased with the paper as a whole, yet there are a few things in it that I would criticise. First, he had a great deal to say about antiseptics; he told us to use antiseptics, but he does not give us the antiseptic that he uses. I don't know how many hundreds of antiseptics we have. There are more new antiseptics constantly being produced than there is time to test. There is something besides antiseptics wanted in the treatment of pulpless teeth and abscesses. The greatest trouble, one of the greatest causes of abscesses, comes from a product of bacteria, the ptomaines. While we want to destroy bacteria, we want also to destroy the ptomaines, and we should use such remedies as will accomplish that purpose. Peroxid of hydrogen is a good antiseptic, but the writer objects to the use of it because it may force some of the *débris* through the foramen, on account of its effervescence. Now, when a gunner fires his cannon he doesn't expect the charge is coming out of the priming-hole; it goes through the muzzle, because that is the place of least resistance: and so in cleansing root-canals, the *débris* will come through the largest opening. There is more danger of forcing it through the foramen with your instruments. We all know that we must use care and judgment in putting our instruments into a canal, and in the cleansing of the canal and the apex, or the apical space, as Dr. Black calls it. I don't know how much space is there.

Some one asked the writer of the paper if he allowed his acid to go through into a blind abscess, and he said yes, he did. That is something I am entirely ignorant about. I don't know what a blind abscess is. I don't know that in my experience I have ever run across a blind abscess. I have seen root-canals and roots which had abscesses ensue, but I don't think the abscess was there until after the canal was closed up. When there is a passage down through a canal to the abscess, I would not call that a blind abscess. The treatment of an abscess is to make it discharge freely, and I think the safest thing to do is to make a fistula. This may be very easily and painlessly done by using cocain.

Now a word in regard to the filling of canals with cotton. Last week I removed a filling from a tooth that was placed in that tooth eight years ago; it was an amalgam filling, and it was thrust right into the pulp-chamber; there had been no effort whatever to remove dead tissue from the canal, or to cleanse the canal, yet there never had been any trouble from that tooth. Now is that reason enough to say that there would never be any trouble if we generally left pulp-tissue in the canals, because in this one case there had been no trouble? Nature is very kindly in many of these things, and overlooks a great many of our mistakes. My great objection to cotton is that it is an absorbent. I have treated a great many abscesses where the roots had been filled with cotton, and from my experience I am utterly opposed to the use of it. If any one has ever attempted to remove such a filling from a root-canal, they will have found it almost impossible to do it. It is almost as difficult as it is to remove a gold filling, and we should not place anything in a root-canal which we cannot easily remove. We do not know what systemic conditions may occur, causing trouble in the tooth to arise, and making it desirable to remove the filling, and in view of that contingency I find nothing so good as gutta-percha.

Then, as to drilling out the canal; I have made it a practice for many years to ream out all canals. I don't pretend that I can ream out every canal, but I find that I can with small drills enlarge the canal. My object in doing so is my own convenience. After I ream the canal out and cleanse it in a pretty thorough manner, I fill it with a little gutta-percha, and seal it up; and I am not going down to find out how far it has gone. I dip the gutta-percha in chloroform and iodoform. I know of nothing that will destroy ptomaines as effectively as iodoform will.

Dr. WATKINS. Dr. Trueman spoke in favor of oil of cajuput. Dr. Meriam, of Massachusetts, told us of that before the First District Society of New York; he recommended oil of cajuput for softening the surface of the gutta-percha, and Dr. Trueman has here to-day recommended the use of it in filling pulp-canals, to soften the surface of the gutta-percha and moisten it. In my hands that has been a complete failure. I have considered it a very great irritant. Dr. Trueman claims that it does not irritate at all. I don't know whether it is my fault or my bad luck, but certainly I had to discard it because I had trouble in almost every case where I used oil of cajuput. I discarded it, and instead of it I use eucalyptol, with chloroform or chloro-percha. I want to second the remarks of the last speaker in regard to iodoform. I don't think I have filled a canal since iodoform was first introduced by Dr. Bödecker, before the New York Odontological Society, in 1884, without using it. After it is placed in the cavity, I do not wash it out; I keep the rubber-dam on, keep it dry, and fill without removing it.

Dr. JAMES TRUMAN. Mr. President, I wish to enter my protest, as an individual, against some of the remarks that have been made here in regard to the action of arsenic. We are an educating body, and many young men may go away from this meeting with the idea that they can use arsenic indiscriminately, and allow it to remain in a tooth for an indefinite period of time without injury. It seems to me that such teaching is altogether out of character, at least with my understanding of the action of this agent. Arsenic is unlimited in its destructive power; it will go on devitalizing the pulp until it becomes inert. When does that time come? No one can tell. It will pass through the foramen and out upon the pericementum, and then you have destruction of the pericementum, and sooner or later the result will be necrosis of the particular parts it reaches, and perhaps necrosis of the surrounding bone. So this is, to my mind, a dangerous experiment. I don't believe in the use of cobalt. It was advocated when I was a student, by Dr. Arthur, who brought it out, as one of the best agents; preferable to the use of arsenic. What do we want of cobalt? We are told to use a certain amount of arsenic and a certain amount of other material, the other material being added to make bulk. The old idea of Dr. J. D. White, that we should place morphia in combination with arsenic to make bulk, was, to my mind, altogether erroneous. We want decided and positive action, and we want to know how much of the arsenic we can use upon the pulp without danger. We want to bring it down to exact figures, and I believe that a thousandth part of a grain is all that can be used successfully in such cases. That will carry the destruction to the upper third of the canal, and we don't want it to go any farther. If you push it any farther you destroy the pericementum.

With regard to abscesses, I think I should agree with my friend, Dr. Maxfield, in regard to blind abscesses. There is no such thing, in my opinion, as a blind abscess. To my mind an abscess is an abscess; and when we have the beginning of an abscess, we have to get rid of it in some way; we must get a discharge of the pus, and we must follow it from the beginning to the end. What is termed a blind abscess is no abscess at all.

Another point in the paper in regard to abscesses I would criticise: that is the curing of abscesses so-called. In my opinion there has never been an abscess cured, and there never can be, unless the cause of the abscess is removed. An abscess means the destruction or suppuration of the pericementum on the root of the tooth, and that once removed, there can never be a return of vitality, and that particular part of the tooth must be inevitably necrosed. How are you going to cure it? You can temporarily relieve it, you can close up the fistula, but beyond that you cannot go, unless you remove the necrosed portion. From my experience, I don't believe there is a single particle of live tissue at the end of a root where there is or has been alveolar abscess. It is dead as absolutely as anything can be which keeps up some relation to the surrounding parts, as the sequestrum and the point of healthy bone in necrosis.

Dr. FLAGG. Mr. President, you see that I have on my lapel the badge of a Hornet. I am a Hornet, and the brother of Hornets, and it is a most unfortunate thing, Mr. President, to be a Hornet. You are in a buzz all the time. There is some fun in having a buzz once in a while; but you after a while kind of get tired of the buzz. I am really beginning to get tired of it. I have been filling the canals of what few teeth I have treated, and I have counted the number to something over ten thousand, and I have filled them for the past twenty-eight years, except a very few experimental cases, with this much-detested cotton, and with almost unparalleled success. I have had that kind of practice that my patients seem to have been perfectly satisfied with it. In the first place, I have the written opinion of Professor Richardson upon three cottons which I gave him, and which were taken from root-canals where they had remained for a number of years. Professor Richardson was a microscopist in the University of Pennsylvania. He returned the cotton with the statement that the fibers were microscopically perfect; the cotton taken from the apical portion of the canal was microscopically perfect. In the second place, some two or three years ago I gave to my friend, Professor Laplace (a microscopist, and a graduate of the Koch laboratory) some cottons which had remained in root-canals a long time, varying from ten to twenty-three years, and he returned them with the statement that he had examined them and found that the fibers were microscopically perfect; those taken from the apical portion of the canal, as well as from the middle, compared favorably with fibers taken from fresh cotton. Now, if at the end of twenty-three years cotton fibers—cotton of a proper kind and properly introduced—are found to be microscopically perfect, how many years will it take before those fibers will become thoroughly disorganized?

I have asked many a man what kind of cotton he used, and the reply was absorbent cotton. "Absorbent cotton!" What do they want with absorbent cotton if they don't want it to absorb any fluid? Again, I have asked sea-faring men, "Did you ever pick up bales of cotton at sea?" "Yes." "Have you any idea how long it had been floating on the ocean?" "Yes; some of it had been afloat for years." I then asked how far the water had penetrated into the bales of cotton, and the reply was that half an inch from the surface of the bale of cotton was found to be as dry as punk. That is natural cotton, with its natural oil, and that is the kind of cotton that I use for this purpose, and always have used. The fact is, gentlemen, that a cotton filling can be made as perfect as any filling can be made, and as non-leaking as any filling can be made. Test it in glass tubes, and you will find it so. And now for chloro-percha; chloroform was used as a solvent of gutta-percha years ago. We were taught to use oil of cajuput as a solvent, and chloroform as a solvent. The oil of cajuput was used to give it a moist state, and was used as a very famous remedy in facial neuralgia. It is also used in the treatment of children's pulps, in the devitalization of pulps of deciduous teeth. After four or five years of this treatment we found that we had great difficulty in getting out the chloro-percha. One gentleman told me he was three hours getting out two chloro-percha fillings that were put in eighteen months before, in the mouth of a young lady. The idea of filling pulp-canals of the teeth of a young girl of a bilio-nervous temperament with chloro-percha! A man must be either a fool or a rascal to do that. He ought to know that a bicuspid of a young girl, with the canals filled, could not certainly remain quiet longer than two or three years at the very outside. I would fill such canals with nothing except a medicated taper twist of natural cotton. That would be the only thing I should think of using in such a case, because I recognize the fact that in from two or three to five years at the outside, particularly in case she should marry, with all the concomitants of pregnancy, etc., it must give trouble; it would be almost impossible for her to have gone through pregnancy without trouble from such a tooth. Under such circumstances a cotton filling is as easily drawn out as the load from the muzzle of a loaded gun.

I don't want to speak of the paper read this morning; but I am asked to do so. They said it was splendid, a fine paper. It is a paper from the Woolly West; and the Woolly West idea seems to be to put in antiseptics, antiseptics, antiseptics, when you want a disinfectant. What is an antiseptic? Does an antiseptic take away bad smells? Does an antiseptic destroy ptomaines? Not according to my ideas of an antiseptic. An antiseptic is something to keep things as you want them after you have them so. I don't use antiseptics in opening pulp-canals; I use a disinfectant. If I want to get rid of the odor of ptomaines, or if I want to destroy microbes, bacilli, or micrococci, I don't use an antiseptic for that. What do I use? I might use peroxid of hydrogen if I hadn't anything better. I would use something a great deal better than peroxid of hydrogen or bed-bug poison. There is a whole lot of things that are better than peroxid of hydrogen. You don't know at all whether it is going where you want it, and you don't know how long it is going to stay; you don't know anything at all about it. Peroxid of hydrogen has been in my practice relegated into "innocuous desuetude."

Then, about not taking the arsenic out from the cavity after a short time. Why not leave it in a week? It would much more nicely devitalize the pulp if you did. Why not leave it a week? If you leave it in a week, you usually take out the pulp with considerably more comfort than if you leave it only forty-eight hours. Leave it two weeks, and you frequently take it away with perfect comfort. Why not leave it two weeks? One of my patients, for whom I was going to devitalize a pulp, told me she had to go over to Europe. I asked her how long she would be gone, and she said about three months. I said, That is all right; I will put in the arsenical application. And I did. My friend Truman here thinks the thousandth part of a grain is sufficient. Well, I don't know that a millionth part of a grain is necessary to devitalize a pulp. If he will take the thousandth part of a grain and put it on the pulp of an upper third molar and let it remain a whole month, and then take it out, he will get out with his reagent just the thousandth part of a grain of arsenic, with the cotton that comes out. I have done it over and over again. What is the use of taking the thousandth part of a grain? Be the amount great or small, the result is the same.

Talking about cotton, one of our boys went before the Examining Board of, I think, the State of Illinois. Finally, they asked him to describe how he filled a tooth, and he stated how he had filled an upper bicuspid by making a little taper twist of cotton and dipping it in his solution, placing it in the root, and so on until the filling was complete; and the examiner looked at him and said, "Why did you fill the canal of the tooth with cotton?" Said he, "Because it was for my mother, and I wanted to do the best thing I knew how for my mother."

Dr. JOHNSON. Mr. President, I will not impose upon the society; my paper has already taken up a great deal of time. I wrote the paper very conservatively, because this was my first appearance before you.

In regard to the question of originality, Professor Peirce said that cobalt was a good thing for the destruction of the pulp, but that it was not original; it had been used long ago. I think I stated very carefully in the paper that I claimed no originality.

In regard to drilling canals, I did not say that I drilled the canal; I said I reamed the orifices of intricate and hidden canals to give me an idea as to the direction of the canal. I do not believe in attempting to follow with a drill a canal that is shaped like that.

I also admitted that good root-fillings had been made with all the materials that I criticised. The argument was that, in view of the fact that we have, as I believe, better filling-materials for the roots of teeth than cotton, it was not good judgment to always fill with cotton. I believe, Mr. President, that if cotton will absorb even half an inch of moisture it is not good for a filling.

As to the use of antiseptics, and the antiseptic I would use, Dr. Maxfield made the statement that I did not say anything about the antiseptic that I use. There are so many antiseptics in use,—and I believe that antiseptics have a place in dentistry as well as disinfectants,—there are so many in use that almost every practitioner has his special favorite, and I left that to the judgment of the society and the individual, as to what antiseptic they should use.

With reference to blind abscesses, if we are to be criticised for the use of the term "blind abscess," the fault lies with the very men who have been criticising that term. It is the term I was taught to use, and it is the term that has been universally used. Granted that it is a mistaken term, these men who criticise us for using it should have long ago given us a better.

Finally, if it is the prerogative of the East to use "bed-bug poison" for the purification of root-canals, I am glad that I belong to the Woolly West.

Dr. FLAGG. I spoke of the use of two per cent. bichlorid of mercury, and I will tell you why I don't like it. I abandoned that years ago, because a patient, while I was using it, put this embarrassing question to me: "Doctor, is not that bed-bug poison?" I said, "Yes, madam, it is; and it is the last time I will ever use it." That was more than fifteen years ago, and I have not used it since.

### *Afternoon Session.*

Dr. L. ASHLEY FAUGHT, of Philadelphia, read a paper entitled, "The Possibilities of Systemic Treatment of Dental Diseases."*

### *Discussion.*

Dr. SANGER. In listening to the paper I have been impressed with the thought that it touches the key-note to a realm which we have not explored enough, and I think that in such papers as this we are making an advance in the practice of our profession. I do not propose, in discussing this paper, to take up the remedies recommended, because to do that would be to depart from the spirit of the paper. I only desire to call attention to the fact underlying it all, that we should aim for something higher than merely mechanical work, that we should study the character and temperament of our patients, and, having studied and grasped their temperament and condition, we should proceed in such a way as to put the patient in fit condition to receive our work with the least harm and the most benefit to the patient. In doing that, medicine comes to our aid ; and if we will only feel that we have the right, and will take to ourselves the right, to practice medicine, where the practice of medicine is indicated in dealing with our patients, having first thoroughly fitted ourselves to do so, then I believe we shall have stepped forward and come up on a higher plane, and that we will be better able to do for our patients the good that they expect and desire at our hands.

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* For Dr. Faught's paper see page 969, DENTAL COSMOS for December, 1894.

The PRESIDENT. Gentlemen, this paper is open for further discussion. We will be pleased to hear from any one who would like to speak on the subject.

Dr. FLAGG. I don't like to take up the time of this association, but I have been very kindly and very politely asked to speak in connection with other subjects. I have felt rebuked as I sat here and listened to the paper just read. I have felt that while I have, as the author of the paper very well knows, availed myself for many years of the excellent adjuncts to which he refers, I have been derelict in my duty in not speaking more to that point when called upon to lecture in that direction, as associated with dental therapeutics. I have pathology and therapeutics as the nominal title of the chair that I occupy ; and as my friend was reading the paper, with my mind's eye I saw my notes upon some of the articles of materia medica that were comprised in my lectures on therapeutics. I saw alcohol, and chalk, and carbonate of soda, and arsenic, and glycerol, etc.; and I remembered to what lengths I had gone in speaking of them, of their uses, of their qualities, and of the variations which we indulge in, in dentistry, from the ordinary pharmacopœia, in order to adapt those means to our special purpose ; and I recalled the fact that hour after hour went by as I expatiated minutely in connection with medicines to the number of some forty or fifty of them, and in doing that I remembered that I had eschewed a large number of medicines, from the fact that I had experimented with some of them, and I had not found that they were of sufficient importance to warrant putting them in the catalogue. And, having done all that, it seemed to me that I had not done quite my duty ; that there was a phase left that I had not sufficiently looked at, and that was the occasional systemic application of medicines in connection with the practice of dentistry. Then I remembered how I had advised patients to take ten or fifteen drops of the solution of bicarbonate of soda at night before going to bed, and to take a two-grain asafetida pill ; and to take another ten or fifteen drops of bicarbonate of soda before coming to the office in the morning ; and how I had given them quassia extract, and even medicaments of some high potency, sometimes in the hundred-thousandth potencies ; and I remembered how those patients had so dreaded the operation of excavating sensitive dentine and had doubt as to whether the remedies would be efficacious, found that the teeth which could hardly bear the touch of a piece of bibulous paper a day or two before, being so very sensitive, could be excavāted without a word of protest; when I remember these things, I feel as though it is my duty to add my testimony to the fact that systemic treatment, from the dental standpoint, is a very nice thing in hyper-nervous conditions, and that properly directed remedies are very beneficial.

In peridental trouble, it sometimes happens that you work until you have opened the tooth, and you have at last succeeded in getting out the chloro-percha from the fine part of the canal, and in giving a great deal of relief to the patient; but the peridental irritation is going on. Then you will use cooling lotions, and probably of all cooling lotions Pond's or Humphrey's extract is as good as any; it is a very cooling local application. But then that it is not quite enough; you say to the patient, when you retire sleep with the head high, either in a reclining chair, or by putting extra pillows under your head to keep your head high. Then comes in the treatment suggested by my friend, the application of general systemic treatment as associated with dental diseases. I have found that one of the best things in such cases is half the contents of a bottle of citrate of magnesia, with a teaspoonful of Epsom salts; then, in about half an hour, give the rest of the bottle of citrate of magnesia, with perhaps another teaspoonful of Epsom salts. This will draw off the circulation in such wise as to have done a very great deal toward producing relief.

As I understand it, this was the idea intended to be brought out by the paper of my friend; and if it is any satisfaction to him, I want to say to him that I shall place systemic medicaments in a very much more prominent position, and shall strive to induct the idea of appropriate systemic treatment, in combination with dental treatment, as an excellent and beneficial adjunct which ought to be indulged in; and if it is any satisfaction to him to hear that I will do my duty better for his paper, I will say that too.

(To be continued.)

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## FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

A SPECIAL meeting of the First District Dental Society of the State of New York was held Tuesday evening, December 4, 1894, at the New York Academy of Medicine, No. 17 West Forty-third street; the president, Dr. V. H. Jackson, in the chair.

### INCIDENTS OF PRACTICE.

Dr. F. MILTON SMITH. Referring to the case of hemorrhage from the gums of which I spoke at the last meeting of this society, wherein I arrested the hemorrhage by the introduction of a compress of impression-material, I wish to make further report. There was no history of any family trouble, and the patient had never had a serious hemorrhage before. The time of my last seeing him, when I reported the case, was on Sunday, and the flow of blood had then ceased. I suggested to him not to leave the house the following day, but his physician allowed him to go out. He went around town for three or four hours, and the hemorrhage recurred, with the addition of a discharge of blood from the nostril, which the physician plugged up. He tried various methods to stop the bleeding from the gums, without success, and after forty-eight hours' profuse bleeding I was again called in. It was not practicable to again use impression-material, as the bleeding surface covered too extended a territory. I applied different remedies to arrest the hemorrhage, the most effectual being fluid extract of hamamelis. Finding no cause apparent to account for the condition, I concluded that it was due to debility. He lived on two meals a day, and worked very hard. On the morning of the Friday following the hemorrhage stopped entirely, and there came out on his person, at different points, decided purpuric spots. He is now attending to business again.

Dr. E. C. KIRK. I should like to report a case which has come to me within the past few days. During the first years of my practice I was called to see a teething infant in which the gums presented a peculiar and unusual appearance. The four temporary first molars were presenting. The gum-tissue was perfectly healthy, and hard and pink in appearance, but immediately over the position of the masticating surface of these presenting crowns a vascular tumor existed. There was a sharp line of demarkation between the vascular growth and the subjacent healthy gum. The physician lanced the tumor, and there was considerable hemorrhage. The inflammatory condition extended until the whole alveolar border became involved in both jaws, the teeth loosened, and for a time it was feared they would be exfoliated. However, in the course of time resolution gradually took place, until finally the case went on to complete recovery.

Two days ago, a physician in my neighborhood sent a lady to me to have her baby's mouth examined. I found exactly the same condition as in the other case ; one of the upper molars had a sac over the advancing tooth, and another presented very angry-looking granulations. It seemed to be specific in its character, but no evidence confirmatory of this could be obtained from the history. The baby was otherwise perfectly healthy, and presented no notable systemic symptoms. I lanced the tumors freely over the remaining teeth, and treated the case locally with a diluted trichloracetic-acid solution for its effect on the tissues. I saw the case again to-day (that is, two days since I made the incisions), and it presents the same angry-looking, granulated appearance. I am not clear as to whether they are attached to the alveolar border, or whether the tumors are simply connected with the underlying connective tissue and the mucous membrane. They can hardly be touched without causing a profuse hemorrhage, and it seems to me strange that such a condition could exist in the mouth without causing some reflex systemic disturbance. I would like to know if any one else has seen such a case.

Dr. S. C. G. WATKINS. I would like to describe a couple of cases which I had to-day in my office. The first is a very small cavity in the grinding-surface of the first superior molar, a cavity which was simply large enough to admit the point of a very fine explorer. I opened and drilled it out with a small bur, and *thought* I had it completed. I had the rubber-dam on, of course. Had it not been on, I should have felt very *sure* that I had it completed, and should have filled it, and failure would have been the result; but having it perfectly dry, and after washing it out with alcohol, I discovered a dark line just between the enamel and the dentine in the anterior part of the cavity. I took a very small bur, and continued cutting for quite a distance just at the junction between the enamel and the dentine. After a while the instrument passed into a cavity, half the size of a grain of wheat, up opposite the neck of the tooth. The only connection that cavity had was the very minute opening from the grinding-surface. I thought it would be worth while mentioning here, inasmuch as it might lead some one to discover such a cavity where they might not suspect it had they not heard of a similar case.

The other case was a tooth in a mouth where all the teeth were of very soft structure,—an anterior approximal cavity in the lower first molar. There was a shell of enamel that extended out over the cavity; and immediately under the anterior coronal point of this shell I was excavating, close to and cutting toward the enamel, my excavator dropped into a live pulp, just as close to the enamel as it could be. It bled considerably, and was exceedingly painful. This case is an exceedingly interesting one, as we seldom see one of this nature.

I saw another peculiar case a few days ago. A patient had had a tooth extracted, and afterward came into my hands. It was a molar, and in attempting to extract it the entire enamel had come off. The entire dentine was in a perfect condition, with the exception of where the cavity was in the distal surface, the coronal points of the dentine and everything, and in that soft, elastic condition that you have seen in a pig's toe when the hoof comes off. It was a permanent tooth, upper first molar. The entire enamel came off in one body. It was just like a shell.

Dr. KIRK. Before this case of Dr. Watkins is lost to memory, I want to record an item regarding it. At the meeting at Old Point Comfort, in August, I see from the Transactions that there were no less than five different cases of resorption of the dentine structure by the pulp reported. Dr. Abbott thought it a very remarkable fact that the only cases of this character ever reported came from Philadelphia. Dr. B. Holly Smith, of Baltimore, said it *was* strange, and the only way he could account for it was that they were cases of degeneration of brotherly love. I want to record the fact that the same trouble seems to have developed in New Jersey. I think the second case reported by Dr. Watkins belongs to that class.

Dr. J. D. THOMAS, of Philadelphia, spoke of the proposed semicentennial celebration of the discovery of modern anesthesia by Horace Wells, to be held in Philadelphia, December 11, inviting the members of this society to attend.

Dr. L. ASHLEY FAUGHT, of Philadelphia, then read a paper on the subject of "Dental Therapeutics," which will be found on page 103 of the current number.

### *Discussion.*

Dr. KIRK. The paper is a very interesting one to me, and it opens up a field of thought and observation that it seems to me is most important; but I have this query or a criticism to make: If we follow the principle which Dr. Faught has laid down, to treat our dental patients systemically for the remote causes of dental disorders, we would be infringing upon the field of the general practitioner very largely. I would go so far as to agree that every dental practitioner should be sufficiently intelligent and sufficiently educated to be able to diagnose the systemic cause of dental disorder; but when he has done that, it seems to me he has gone far enough. If we reverse the case, it will make my point clear. If the medical practitioner should discover that certain systemic diseases are caused by certain diseased conditions of the teeth, there is no reason why he should not by the same rule invite that patient into his office and fill and treat his teeth. There should be a limitation. We should draw the line somewhere, and, to my mind, it would be at the point of being able to diagnose what the trouble is. To undertake the constitutional treatment of it seems to me as slightly out of our sphere. There is another point which ought not to go out unquestioned, and that is that dental diseases are in the main of systemic origin. They are composite in their etiology, and the systemic factor is only one of them. It seems to me that the statement of the essayist in this connection needs a little more careful definition and qualification. I agree with the essayist heartily in the stand he takes with relation to being able to discover and intelligently understand the systemic disorders related to the teeth, and that too little of our work is related to that phase of it. I think even a superficial examination of the subject will prove to almost any man the close relationship between lithemia and dental manifestations, and inasmuch as there is a question of cause and effect involved there, it is proper for the dentist to recognize it. If we can suggest to the medical care-taker in the case the line of treatment to be pursued, it is of course very good. I want also to call attention to Dr. Faught's quotation from Mr. Charles W. Folkard's article on lithium salts in the *Chemical News*. That paper was a beautiful example of reasoning from partial premises, in which the expert chemist attempts to explain a therapeutic action without a correspondingly full knowledge of therapeutics or physiology. It reminds me very strongly of a similar criticism of an article of mine on gum-lancing written by an ophthalmologist. Since the paper by Mr. Folkard was written it has been fully dissected by a careful observer, Dr. Enno Sander, who has demonstrated the falsity of this chemist's article in his "Notes on Lithium" in the *Journal of the American Medical Association.*

I have tested the lithium salts pretty thoroughly, and have found good results from them. I have not had as good results from the salicylates, because of their tendency to produce gastric disturbance. Cascara sagrada seems to be of great value in lithemic trouble. Cascara sagrada alone, without either lithium or salicylates, will do much in the way of eliminating the cause of the difficulty. We must bear in mind that we have two channels of elimination of the chemical ptomaines, as we might call them,—one by the kidneys and the other by the intestinal tract,—and both should be taken advantage of. But to go into an extended treatment of these difficulties seems to me to be beyond the sphere of the dental practitioner. He should turn the patient over to those who are naturally, by reason of their special training, more competent to attend to the treatment.

Dr. F. T. VAN WOERT. I am at a loss in attempting to discuss this paper. I came here to-night expecting Dr. Faught would present something in therapeutics that might be of use to the general dental practitioner; and while I agree with him in that it would be well to understand all the systemic disorders, and the remedies to control them, still I think Dr. Kirk has expressed the sentiments of most of us when he stated that it was not within the province of the dental practitioner to go beyond the local treatment. We know little enough of this, and our efforts should be for a better knowledge of the remedies we now have in hand. I think I am safe in saying seventy-five per cent. of our members use drugs and chemicals mechanically. They expect certain results, and get them in many cases; but if you were to ask them for the pathological and chemical changes which bring about these results, they would be entirely at sea. Now, with these facts staring us in the face, would it not seem more practical for us, as a profession, to stick to our specialty until we become perfect in its science, and not attempt deep-sea fishing with a mill-pond tackle? I am reminded very much, in this connection, of an acquaintance who has a very marked talent for art, and has adopted that as a profession, making a miserable failure of life, for the simple reason that he never finishes anything. He will start what promises to be a very creditable picture, and when one-half or two-thirds completed he will abandon it for something higher. The result of which is, he has no reputation as an artist, and is in a chronic state of impecuniousness, which I fear very much will be our condition if we undertake to ape our colleagues in the medical profession. We have enough, and more than we can manage, for the present, at least, to perfect ourselves in dental therapeutics, which consists chiefly of local remedies and treatment. I am pleased with Dr. Faught's paper, for the reason that I appreciate his pleasure in the knowledge of these matters. But personally, I am free to confess that the subject is outside the limits of my sphere of study. In consideration of which I will not attempt a scientific discussion of this paper.

Dr. FAUGHT. I have to thank the gentlemen for the courteous way in which the paper was listened to. Such papers must be read. As long as we believe that the systemic condition has anything to do with the treatment of teeth, we ought to pursue that line of treatment. I wish to call special attention to the fact that the strong argument of the paper was not so much to advise the gentlemen to enter into the treatment of the diseases or the use of drugs,—in fact, I stated that very clearly,—but to lead our patients into hygienic lives, so that by going back of the trouble we can quiet that nerve-trouble which causes the pain.

In regard to the paper which was written by Folkard on lithium carbonate, I know it has been pulled apart; but I believe it will be put together again. It is a fallacy, so far as I see, and I believe it will soon be found to be so. Up to a year ago there was only one of the so-called lithia waters on the market that had any lithia in it. I believe the good in all these waters is the fact that they are a good, pure spring water, and persons who are taking them use large quantities. I have known people to take a gallon and a half a day. It is flushing the system with water that is lacking in nitrogenous compounds that does the good. If you take good, pure water and use it in that way, it will bring about the same results. I have most absolute faith in the salicylic-acid compounds. I have found great benefit to come from omitting in our foods the use of chlorid of sodium. There is no necessity for our using it. Take yourself as an example, and note the number of times that you make use of salt upon your food at the table. You can shut that off. I have made a large use of diluted phosphoric acid in the treatment of the uric-acid diathesis. I am not in a position to explain how it acts, but in the cases where I have used it and followed its effects I have had most wonderful results. The phosphoric acid seems to find its elimination through the kidneys, and seems to bring about an acid condition sufficient to keep these materials in suspension. I know that a paper such as this is very difficult to take up on an instant and speak about; and yet such papers, I think, ought to be brought before our societies, and for that reason I took the opportunity to present it here.

Dr. STARR. Does Dr. Faught think there is any close relation between the local disorder, so called, known as pyorrhea alveolaris, and the general or systemic disturbance called uric-acid diathesis?

Dr. FAUGHT. I think there is a decided relationship between the two.

Dr. KIRK. This subject is so important that I think we should have all the light possible on it. The practical test is the therapeutic test. Dr. Faught's experience is valuable as far as it goes. He has had good results from the salicylates, and not from the lithium carbonates. In my own case, individually, I have not been able to make any use of the salicylates, because they disturbed the digestion always. I have tried the carbonate of lithium, and I did not get any good results. I have gotten better results from the combination of lithium with the organic acids. It has been shown that in the burning up, or the oxidation of these acids in the system, the result is the forming of carbonate of lithium in the blood-serum. There is a considerable difference in the efficacy of the carbonate presented to the system in that way, and that in which the carbonate of lithium is taken in bulk into the stomach. Moreover, in making practical experiments with the lithium preparations, I find that as between the citrate and the bicarbonate there is a marked difference in therapeutic effect. With a uric-acid headache coming on, one of those absolutely paralyzing and debilitating headaches, ten grains of the bitartrate of lithium taken dry will, inside of twenty minutes, relieve the condition. It may not act so with other people. I know patients who get the same results from the sodium salicylate. I do not want Dr. Faught's clinical experience with the salicylates, as put over against my own experience with the lithium salts, to be taken as evidence that the one is better than the other. I think there is a question of individual conditions to be included in such an estimate of the comparative value of the two classes of drugs.

Dr. FAUGHT. I am grateful to Dr. Kirk for calling attention to that. I had an experience in the same lines. I want to say also about the salicylates, that they do interfere with the digestion. They have that unpleasant effect, and it must be guarded against. The administration must be changed or dropped and gone back to again in order to get the good effect. If you are going to use the salicylate of sodium, you must get forty grains into the stomach inside of twenty-four hours. It cannot be used with a light hand and the same effect obtained. After a week or ten days' use, you will find the condition of numbness superseding the effect of the salicylic acid. You must go at it persistently, or it will not act.

Dr. STARR. I would move that this society extend a vote of thanks to Dr. Faught for his able paper and valuable contribution to our proceedings.

Motion carried. Adjourned. B. C. NASH, *Secretary*.

## SECOND DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

A REGULAR meeting of the Second District Dental Society was held on Monday evening, November 12, 1894.

Dr. E. S. HODGSKIN, of Brooklyn, read a paper entitled "Abscess of the Antrum of Highmore," which will be found on page 101 of the current number.

### *Discussion.*

Dr. O. E. HOUGHTON. I think that Dr. Hodgskin deserves the thanks of this society for his short, concise, and instructive essay. Now, on the subject of abscess of the antrum, I must confess that in my experience of nearly twenty-five years, I think I have not seen a half-dozen cases. There have not come under my treatment more than three in the twenty-five years. Other dentists may have been more fortunate or unfortunate. I do recollect a very serious one that I had in charge nearly twelve years ago. A lady had been treated by a physician for "tumor of antrum." He informed her that a surgical operation would have to be performed to remove it. Her husband was very anxious about her, and, meeting me one day accidentally, he insisted upon my coming up to see the case. I found the patient in bed, very pale, and with septic poisoning strongly indicated. She was suffering a great deal of pain ; the right eye was nearly closed, and she was in a very bad condition indeed. She told me that some two weeks before she had gone to Dr. Colton, in New York, and had a third molar extracted. She had been wearing an upper plate for ten years. It appears that this third molar first made its appearance under the plate about a year previously, finally causing so much annoyance and irritation that she had it removed.

The root of the third molar unquestionably penetrated the antrum, and she complained of a peculiar sensation just below her eye soon after it was taken out.

On examination, I found a fungus-like growth in her mouth, where the tooth had been removed. I punctured through this to the antrum, and there was immediately a copious and exceedingly offensive discharge of pus and blood.

I washed the antrum with warm water several times, then used about a ten per cent. solution of chlorid of zinc. The patient was relieved of the excessive pain, endured for days, by the first treatment. I used a carbolic-acid swab in the passage to the antrum, which helped to keep the drainage open.

The second day's dressing was similar to that of the first. I gave, in all, nine treatments, and used no other remedy than warm water and chlorid of zinc. The cure was complete, and three years after no trouble of any kind had ensued. I think that peroxid of hydrogen would have been very efficacious indeed, but I should be afraid to use it in the antrum in any great quantity, on account of its effervescing qualities.

Dr. W. E. Halsey. I can hardly agree with the essayist in the use of hydrogen peroxid in full strength as a disinfectant solution in the antrum, because of its violent action when brought in contact with pus or any of the secretive fluids, and the consequent formation of gas.

The antrum is lined with ciliated epithelium, which is exceedingly delicate in its structure and also in its physiological action, which is the evacuation of the cavity through its natural outlet into the middle meatus.

If sufficient drainage is secured through the lowest portion of the cavity, which is best done through the socket of a second molar, a very mild disinfectant solution is all that is demanded. In my opinion, listerine will usually meet any indication,—about one part to twenty of water.

Diseased conditions of the antrum which present themselves to dentists are usually simple in character, easily diagnosed, and are the result of a diseased condition of the teeth.

A patient was brought to my office about a year ago by a neighboring physician, who had been treating the case some months for a purulent catarrhal condition of the right nostril. I found the teeth in excellent condition and without decay, but the second permanent molar gave forth the peculiar sound characteristic of the presence of a devitalized pulp when tapped with a steel instrument. The removal of the tooth was followed by a slight discharge of pus, and a copious flow followed the enlargement of the mesio-buccal socket, analogous to the discharge from the nostril.

The antrum was syringed each day for a week or more with warm water and listerine (about one part to twenty), when the rubber drainage-tube was removed and the opening allowed to heal. The nasal discharge ceased with the closure of the opening, and no recurrence took place. In chronic cases of an abscessed antrum, where a portion of the wall has become carious, and the removal of which leaves a large opening, no effort should be made to close it, as the function of the ciliated epithelium is impaired, if not wholly destroyed, and a recurring abscess is the usual result; whereas the daily syringing of the sinus by the patient will maintain cleanliness and general comfort so far as the condition is concerned.

The points of drainage and cleanliness, as set forth by the essayist, are all important, and his use of the rubber drainage-tube is ingenious and efficient when there are no approximating teeth to ligate to. We are all apt to meet abscess of the antrum in our practice, and should be able to cope with the conditions as they present themselves.

Dr. P. H. Sturges. I have had a few cases of abscess of the antrum, and the subject is one of great interest to me. I cannot discuss this subject from a dental standpoint. The first case that came under my care, more by luck than skill I was able to properly diagnose, and since then I have made the disease one of special study.

I was very much interested in listening to the paper of the evening, and there were very few points made by the speaker that I would take exception to. It seems rather strange for a physician to discuss a subject of this sort before a dental society, and I beg the indulgence of the society if I appear somewhat embarrassed.

My attention was first called to this subject about a year and a half ago. I then had a patient from whose nose I had removed several polypi. He complained of a purulent discharge from the right nostril, which he stated had troubled him for twenty years. I confess that for some time I blundered with him, and the only wonder is that he kept coming to me; but he did, and to-day he is cured.

At a meeting of the section of rhinology, at the New York Academy of Medicine, over a year ago, Dr. Robert C. Myles read a paper on "Diseases of the Accessory Sinuses of the Nose." He cited about twenty-four cases which he had seen in one year, and stated that probably many exist, but go unrecognized. He demonstrated transillumination as a means of diagnosis.

In regard to the etiology of abscess of the antrum, Bosworth places first in importance the presence of nasal polypi, next hypertrophic rhinitis, and lastly disease of the teeth. Is it not reasonable to suppose that in some cases the teeth become affected secondarily,—that is, that their disturbance is the result rather than the cause of empyema of the antrum?

My experience in antral diseases has been almost entirely with chronic cases. Dr. Bosworth thinks (I quote Bosworth as a favorite authority of mine) that many are chronic from the outset,—that is, there are no acute symptoms, such as severe pain, fever, and swelling. If the natural opening is patulous, of course there is no over-distention with pus.

In one case I have had under treatment recently there was no pain, but simply the disgusting discharge and the inconvenience caused by it. It is true that in many, where the natural orifice is occluded, there is intense pain, fever, and deformity.

In regard to transillumination, I agree with the speaker that it is not a positive method of diagnosis, but taken with other symptoms it aids in confirming it. In many cases it is possible, by means of a slender silver canula, to wash out the antrum through the natural orifice. If pus comes out with the washing, this of course makes the diagnosis certain.

In regard to the treatment of antral abscess, it may be summed up by saying that treatment should be based on sound surgical principles. The antrum should be drained, cleaned, and anything keeping up irritation removed. If a carious tooth be the cause, it should be extracted, the opening enlarged, and the cavity treated through the opening made. In some antra I have found a thick pyogenic membrane, which it is necessary to thoroughly remove with a sharp curette.

I prefer to make an opening through the canine fossa, as I find the cavity is more accessible, and treatment is less hampered. The opening should be at least half an inch in diameter. I generally use a solution of carbolic acid as an antiseptic wash.

I have had some experience in the use of rubber drains, and find they answer the purpose very well; although in chronic cases I rather prefer a gold tube. In chronic cases the tube should be left in place for a sufficiently long time to make assurance doubly sure that there will be no retention of pus.

Dr. HODGSKIN. I seem to have been much criticised for applying peroxid of hydrogen. I had been using it for other purposes, and in my first case of disease of the antrum it occurred to me that it would work equally well in this. I used it, and the result was very satisfactory. A great many dentists, especially in Brooklyn, are in favor of peroxid of hydrogen, and I have never seen any results except good ones follow its use.

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At a meeting of this society held December 10, 1894, the following subject was introduced for discussion by Dr. J. P. Geran, of Brooklyn: "Do the oxyphosphates and oxychlorids, when placed in contact or in close proximity to the pulp, cause its death?"

Dr. GERAN said in part,—

Next in importance to pyorrhea alveolaris is the vexed question of how to save the vitality of the pulp when exposed. No questions of greater interest and importance to the dentist have or are likely to claim more of his attention than that touching these two lesions.

The practice of some operators is to cap all exposures. With the more conservative, it is to destroy only those that are in a high state of inflammation. Others devitalize not only exposed pulps, but also those having a layer of carious dentine over them. This method they claim to be the most successful and the most satisfactory to their patients, because there is less subsequent discomfort.

As to the man who caps all pulps—well, we have all been called upon to relieve some of his patients by trephining the alveolus, or opening the tooth, with satisfaction to ourselves and relief to the patient. In my own practice, if I find a pulp has given more or less pain for several weeks, or even days, I believe it to be in a high state of inflammation; subdue it for twenty-four hours, and then devitalize.

With a normal or sudden exposure, especially in any of the six or eight anterior teeth, I would first sterilize with about twenty per cent. carbolic acid; then make a gold or tin cap, fill its concavity with a paste made of lanoline, oxid of zinc, and iodoform; cover and fill the cavity with oxychlorid of zinc.

Should I find caries in close proximity to the pulp, I would sterilize as before stated, and cover the intervening space with gutta-percha, and then finish with oxychlorid.

I think it is useless to expect a new formation of dentine. We are often led to believe that such formation has taken place, by the comfort the patient experiences; but if we could examine these operations thoroughly, we would discover that this comfort is derived from the desiccated condition of the pulp, when oxychlorid has been used. I remember seeing but one case of secondary dentine deposit taking place from this or any other material. This was in the pulp-chamber of a superior bicuspid, in the mouth of a gentleman whose vitality was above the average. In my judgment, although I admit this is at variance with very good authorities, until some other superior material can be found, reliance must be placed on oxychlorid of zinc. Not that it is a saver of pulps, but because of its desiccating and antiseptic qualities, and its tendency to retain the color and harden the soft tooth-structure.

Why oxyphosphate does not possess these qualities is beyond my comprehension.

The penetrating property of the zinc chlorid gives it a decided advantage over every other agent on account of its therapeutic qualities, and it doubtless is the germicidal power which prevents the decomposition of the dead pulp.

The effect which zinc chlorid produces on the dentine structure may be from the irritation of the chlorid to the pulp and its surrounding fibrillæ, producing what some of the old text-books call exaggerated repair, overdoing its work, as it were, by throwing out a superabundance of osseous matter until the whole structure is in a calcified state. We do not find this condition produced with oxyphosphate.

For these reasons, when there is a thin intervening space between the pulp and a filling, I would give the preference to oxychlorid.

It has been my experience that unless there is a thick intervening section of good healthy dentine between the pulp and filling, oxychlorid and oxyphosphate of zinc will eventually destroy the pulp.

Dr. F. E. Howard, Buffalo, N. Y. I believe that in many instances the oxyphosphate does cause death of the pulp, especially where sterilization of a cavity with a coagulating antiseptic has been neglected.

Glacial phosphoric acid exerts a deleterious influence when brought in close proximity to the pulp, but I have been able to counteract this tendency by the addition of creasote to the zinc phosphate during the mixing. In my practice, I have found that it has so modified the action of the oxyphosphate that I can use it with impunity where without it I should hesitate to make the application. Before the paste has begun to set, I combine with it enough of creasote to make the mixture permanently antiseptic. Glacial phosphoric acid is an irritant, and, as it is not an antiseptic, there is nothing to prevent disorganization of the tissues beneath it. The irritation is not of a character to stimulate, but it rather seems to exercise a depressive action, and the final result is a dead pulp, with consequent predisposition to the formation of an abscess. The addition of creasote in many instances prevents this catastrophe, and very satisfactory results follow its application provided the pulp is not exposed and is protected by a thin covering. I do not think oxyphosphate possesses the proper qualifications for a pulp-capping material. The admixture of creasote does not change its wearing qualities when the entire cavity is filled with this material.

Since the first introduction of oxychlorid, about twenty-five years ago, it has been both extolled and abused. In my judgment, it will do all that has been claimed for it as a pulp-capping material provided the cavity has been properly prepared for its reception and the application is made with due precautions, and the latter is made carefully upon correct principles, to healthy exposures made in excavating. Just the right proportion of the mixture must be applied in order to get the desired effect.

To successfully cap the pulp we should furnish the right proportion of stimulant. An overdose of this will destroy vitality. When this occurs, there is not the same liability to the formation of an abscess as when zinc phosphate is used. Mummification is sometimes the result.

I believe that every true pulp-capping material should possess stimulating and antiseptic properties. Without this there will be nothing to induce nature to make an effort toward recuperation. My experience has been that exposed pulps may be capped successfully with some non-irritating substance. While the exposure will tolerate the presence of non-conducting substances of varying character, the zone of exposure will remain open for an indefinite length of time, there being no effort on the part of the pulp to recede and protect itself by an ossific deposit. A line of experiments conducted some years ago bears me out in this assertion.

To illustrate, I have capped with gutta-percha many exposed pulps which I have opened up two or three years later, and found the pulp in apparently the same condition as when first capped.

Such has been my experience with this material in a number of instances.

While we are not discussing the subject of pulp-capping in general, I mention this fact to sustain the assertion that I have made, to the effect that I believe a successful pulp-capping must be a stimulant, and necessarily an irritant, in order to induce the deposition of the ossific deposit, which is the natural protector to the organ itself. Nature teaches us this lesson in the example of the influence of decay upon pulp-tissue, which in some cases causes the pulp to recede and protect itself from the presence of decay and irritating influences. Again, this is exemplified by that class of teeth that wear down by mechanical abrasion. As the attrition advances, the irritation causes the pulp to recede and protect itself. If the wearing takes place more rapidly than the pulp recedes, the irritation is followed by inflammation and death.

Amalgam and gold filling, when placed in close proximity to the pulp, where non-conduction precautions have not been taken, will either destroy vitality or excite recuperative action.

Chemical or mechanical irritation exerts the same influence upon the pulp in promoting its activity. So, in the use of oxychlorid of zinc, just the right proportion must be used, and this can only be determined by experience and good judgment. Without this the excessive irritating influence of the escharotic elements will be followed by inflammation and death.

Let us now return to its application, in healthy exposures of the pulp, by excavation. For example, in a cavity with fairly deep surrounding walls, let us make an application of creasote, or creasote and oil of cloves combined. By its affinity for the tooth element an insoluble compound is formed, sealing up the tubules of the dentine and furnishing a natural protection to the zone of exposure, and establishing a condition of non-conduction to that element of the tooth-substance that was extremely sensitive and was primarily a delicate wounded surface. This has now been changed to a less sensitive state and protected.

We are now ready to make an application that will be acceptable, and that will furnish tonic, stimulating, and antiseptic properties. These I believe oxychlorid of zinc will supply if applied as follows:

The oxid of zinc, mixed with creasote to about the consistency of cream, is taken up on the end of a small spatula and passed to a piece of spunk, cut into small squares of a size that will be admissible to the cavity, by means of the pliers. These are gently carried to the zone of exposure, and patted down to place without pressure. We now have done little more than to cover the zone of exposure with a very thin layer of material. With oxychlorid of zinc mixed to the consistency of thin putty, a little creasote being added, make this application to the cavity in general as a lining-material in the same manner as to the pulp-surfaces. The spunk will absorb a certain amount of the liquid, leaving a sufficient quantity for stimulating purposes.

If the cavity is a deep one, and it is desirable to line up still more, use a zinc phosphate followed by a metallic filling, if such is desirable, and at the same time unhesitatingly. Were I to fill the whole cavity with oxychlorid of zinc alone over the immediate pulp-capping, instead of putting in the thin lining, I should expect the pulp to die in many cases from over-stimulation.

Were I under the circumstances mentioned to cap an exposed pulp in an approximal cavity of an anterior tooth, in which the territory was limited, it being small and shallow, I should make a slight change for strength of capping. Following the antiseptic coagulant I would mix oxychlorid of zinc to the consistency of thin putty, and add a little creasote and oil of cloves. This I would apply to the exposure, making it a general lining for the cavity and introducing the metallic filling, making it complete at one sitting. I find no difference in the results produced by these two methods.

Years of experience in this line of work, keeping tabulated records, with a class of patients entirely under my control, have enabled me to watch and determine the results. By opening up special cases, two, three, and four years after the capping has been made, I have demonstrated that they are yet alive and well protected by ossific deposits. This has been induced to a considerable extent in many cases in which a capping was not necessary for the protection of the second filling.

My experience with this material warrants me in saying that I have no more hesitation or fear of the results in capping an exposed healthy pulp under ordinary circumstances than in putting in an ordinary filling, so far as the success of the operation is concerned.

Dr. S. B. PALMER, Syracuse, N. Y. The question as it stands is a compound of two truths. The first step is to divide the elements; and we have two statements,—they do cause death of the pulp, and they do not cause death of the pulp. It is too often the case in discussions, when a subject is thus divided, that members take sides and attempt to prove their position.

This is not a scientific method. I will present my views from the two extremes, for the sake of distinction.

A law in chemistry is this: Under the same conditions, with the same substances, the same results follow the same causes; so, if we observe the conditions under which pulps are devitalized by close proximity to either material, we may be certain of like effects. The same is true of pulp-preservation.

Thus we have something like a rule to work by.

What are the conditions for pulp-preservation?

First, the death of the pulp is due to pulpitis, produced by acid reaction. This may occur from immediate contact of the material to a nearly exposed pulp, when no care has been taken to insulate the filling, but more frequently by decomposition of the cement, by which the acid is set free. Moisture or fluidity is essential to such decomposition. Here comes in a distinction when the dentine is normal and the pulp is covered sufficiently to prevent fluid contact with the filling, or when a varnish or non-conductor is used to prevent contact. The above-named articles do not destroy pulps, because fluidity is essential to decomposition. On the other extreme, where the dentine contains much organic matter, moisture is present which has affinity for the acid in the compound. Inflamed dentine is a result, and I believe this condition does more than to dissolve the lime-salts from the pulp covering; but nature, instead of calcifying to protect itself, as it does under gutta-percha, reverses the action and takes back the lime element, as in the case of large gold fillings which have done service for many years.

Dr. J. FOSTER FLAGG, Philadelphia, Pa., after expressing his regret that he is not able to be present this evening, writes as follows:

I dislike, even yet, to lose any opportunity for the *accurate* consideration of any of the "plastics," for I hold that it must now be largely recognized that the heavy end of all our really difficult and almost hopeless work is carried by the *accurate* utilization of the several materials known to dentists under this common appellation.

You cannot but know that I feel my strongest interest in dentistry to center in this work, and I confess that with all these many years of experience which one might suppose would have brought *familiarity* with extraordinary results, I yet regard with wonder, delight, and huge satisfaction the employment, in frail teeth with pulp-cavity complications, of four, five, or six different plastics, each meeting its indications in a manner so full, so admirably, so "without discount," as to cause one irresistibly to thank the Giver of all good things for these great blessings to suffering humanity.

First, then, I would say that oxyphosphate is a name which is improperly applied to cements which are made from *nitrated* oxid of zinc and glacial phosphoric acid, either in solution, gelatinized, or recrystallized, and which are properly called *zinc phosphates*. *Oxy*phosphate is made from any menstruum of zinc phosphate combined with oxid of zinc. This makes a very *white*, though not very resistant, cement. It is used *exclusively* in the incisors, cuspids, and bicuspids, and only in pulpless teeth; and for the purpose of *ob*taining and *re*taining an acceptable color. So you will see that the action of *oxy*phosphates upon pulps is not discussible. The action of "oxychlorid" on pulps is a subject admitting somewhat more latitude, though in the more than thirty years during which this compound has been used its employment seems to have been practically reduced almost completely to the "lining" of cavities of decay in teeth *less* than "above medium" in structure. In fact, this is the *only* use I have made of it, or have taught for it, for more than twenty years. Now the "lining" of any cavity with oxychlorid is a work almost exclusively confined to the side walls, and this is always the more decidedly so, in vital teeth, just in proportion as the cavity approaches the pulp.

Then it is that the placing of red base plate, rubber varnish, temporary stopping, or zinc sulfate has always, in educated hands, preceded the "lining" with oxychlorid, and thus has the possible irritation of the chlorid of zinc been avoided. So that even this material would hardly be regarded from the "plastic" standpoint as one to be discussed in connection with pulp-irritation. But now we are brought to the consideration of zinc phosphate proper as a possible pulp-irritant and devitalizer. This is the more seriously to be considered, from the fact that this material is very largely used as a "filling-material" pure and simple. Recognizing its ease of introduction, its resemblance to the teeth (by shading) in color, its non-shrinkage, its consonance of potential with even the softest dentine, its frequent comparative insolubility in the fluids of the mouth, and its comparative resistance to attrition, it would be strange indeed if it were not frequently resorted to as a means for saving teeth; and when to this is constantly added the utterly unwarranted assertion of its advertisers, that it is eminently useful as a pulp-protector and unsurpassed as a pulp-capper, thus instilling the belief that it is a reliable help in even the gravest of pulp emergencies, it certainly is well worth careful and extended discussion, to the end that, if possible, we may arrive at some definite conclusion.

For myself, I early had so many untoward results, eventuating in pulp-devitalization in cases where I thought the "protection" should have been amply sufficient to have insured maintenance of vitality, that I soon began to have such grave doubts as to the propriety of placing zinc phosphate any other than distant from pulps, that I was further led to conclude that *protection from the zinc phosphate* was probably vastly more desirable. The use of solution of phosphoric acid for the obtunding of sensitivity of dentine was also very promptly abandoned from numerous pulp complications which *seemed* to attend upon its application in deep-seated cavities of decay, and this was regarded as accentuating the testimony adverse to the employment of zinc phosphate in proximity to pulps.

Now, while all this experience tends to indicate the possible need for care, it is yet true that many large cavities of decay, closely approaching vital pulps, have been satisfactorily and successfully filled with zinc phosphate. *Satisfactorily*, in that decay has been arrested, the beauty and usefulness of the teeth maintained, and that the fillings have stood the test of many years of service. *Successfully*, in that the vitality of the pulp is unquestionable, and thus that *perfection* in the way effort has been attained.

In these cases, then, the question is, has the filling-material been alike advantageous to tooth-structure and to pulp-structure, or has the pulp-structure merely demonstrated its ability at resisting an ordinarily injurious impression.

As this is a matter absolutely impossible to determine, and as pulp vitality is almost universally conceded to be a most important factor in the preservation of tooth integrity, and as it is a matter of ease to almost positively protect a pulp under ordinary circumstances, and to protect with reasonable assurance of success under many doubtful conditions, it has seemed wiser to me that I should not permit zinc phosphate to be placed in any doubtful contiguity to vital pulps, and that I should regard it as most decidedly *not proven* to be a desirable pulp-protector, and especially to be denounced as a pulp-capper.

Dr. W. S. ELLIOTT, Port Jervis, N. Y. In regard to the question, "Do the oxyphosphates or the oxychlorids, when placed in contact with or in close proximity to the pulp, cause its death?" I would say, from practical observation, I am convinced that oxyphosphate of zinc is *not* a suitable application to an exposed pulp, or even to one having only a thin covering of dentine. It will, I believe, in most cases destroy its vitality, or so endanger it as to eventuate in death. The dental pulp is an embryonal tissue capable of maintaining the integrity of the dentine, and possesses powers of reparation if the lesion is not too extensive. Oxyphosphate is too far removed from the conditions of vital existence to be compatible with the well-being of the pulp,—and I might say any body bordering upon the inorganic will ever prove detrimental. We must look to physiological processes to insure the maintenance of the tissue; all effort should be directed to the encouragement of nature's effort in this direction. Those who advocate the use of the cements award them the merit not their due, from the fact that prior treatment is generally instituted by the application of an escharotic, such as carbolic acid or creasote. Herein lies the secret of success, if success really ensues, for the albuminoid elements of the pulp-tissue—that is, the peripheral cells or globules—are partially arrested in their function, and made to simulate a semi-vitalized covering, not altogether foreign to the well-being of the pulp. The function of the cells is not thereby impaired, though of course they have passed the period of dentine-formation, but hold in reserve the power to deposit lime-salts in an amorphous condition recognized as calcification.

Here let me emphasize my conviction that even carbolic acid should never be used for preparative treatment. It is too powerful in its action, and will overbalance the vital forces which we should endeavor to conserve. Practically, Merck's creasote has proven the most efficient remedy. The exposed pulp should be at once flooded with the medicament, then the excess taken away and a layer of zinc oxid applied as dry as is convenient to handle, covered with a concave disk of sheet lead. Now the cements may be used as judgment may dictate.

Dr. A. H. BROCKWAY. I have not capped many pulps in late years. I used to do it often, and very successfully too; but I found, after a time, so many of such pulps died, that I was rather discouraged from continuing the process. I believe that if the pulp is exposed this treatment is generally unsuccessful, especially if there has been inflammation in the pulp. I think it a waste of time to try to save it alive, for two reasons: first, attaining success is a matter of extreme doubt; and second, it is not necessary. Of course, in a young tooth the pulp is very much more necessary than in one fully matured. Where the exposure is recent, and there has been no inflammation in the pulp, it has been my practice to follow the method which Dr. Howard has laid down, and I should do so with reasonable hope of success.

As stated before, in cases where there has been inflammation, and especially where the tooth is fully matured, there is not much necessity of trying to save the pulp alive. If it is removed, the pulp-chamber properly treated so as to secure an aseptic condition and properly filled, my experience has been that it is pretty certain to be a valuable and successful member of the dental society for a long time.

Dr. O. E. HILL. Undoubtedly, with careful manipulation pulps can be capped successfully so that they will last possibly a great many years, with the exception, perhaps, of the lateral incisors, which I consider the most troublesome teeth that we have.

I wish to say that there seems to be very little distinction made between creasote and carbolic acid. The latter should never be applied to exposed pulps. A good dentist should never be without creasote, and whenever he caps a pulp that is what he should use, and never carbolic acid, which is an escharotic. Carbolic acid will be injurious to the pulp of any tooth, and will give trouble, while good creasote will not.

Dr. D. W. BARKER. One of the gentlemen has spoken of mixing creasote with oxyphosphate or oxychlorid. I have found that rather difficult and uncertain. The mass is apt to be greasy, and when applied to a cavity it won't stick fast. There are two methods that I have used successfully, and I think with a greater proportion of success than anything else—not in pulp-capping, but in that class of cavities where a layer of something is to be placed next to the pulp. I have used a combination of iodoform, or aristol mixed with the cement powder in equal parts, and then mixed with the cement liquid, and applied in a thin layer over the place where the pulp is almost exposed. I have also found a very excellent way of protecting the pulp is by cutting a very small piece of court plaster, carrying it to the spot and gently touching it to place with the pliers. It easily sticks fast.

I don't cap an exposed pulp, no matter how slight the exposure is, and whether made by decay or by accident. I kill it, with the ardor of youthful enthusiasm. I formerly tried to save them, but found that unsuccessful.

Dr. HILL. It is always well to try to save the pulp ; it does no harm. It is so simple to make the effort ; if there is any trouble, the patient will come to you, and you can then destroy that pulp without difficulty.

The idea of court plaster is a very good one. I think it is a dangerous practice to advocate that it is useless to try to save a pulp when it is slightly exposed.

Dr. F. T. VAN WOERT. I think Dr. Barker misunderstood one of the gentlemen to claim that he mixed creasote with the oxychlorid or oxyphosphate of zinc. Dr. Flagg states distinctly that he mixes creasote with oxid of zinc, making a thick paste, and then mixes the oxychlorid or oxyphosphate and places it over the creasote paste. That was the method practiced by Dr. Slater when I first came to Brooklyn, and he showed me that same method.

Dr. HILL. A far better application than that is Canada balsam ; twenty-five years ago that material came up for discussion, and most of us have used Canada balsam ever since ; certainly there is nothing in the world better.

Dr. C. S. VAN ORDEN. I find that, taking it all and all, cement is a very treacherous filling, especially in a cavity extending nearly to the pulp. If in a young tooth, of course there is so much the more uncertainty. Now, I find that the best way for me to fill a tooth having a pulp nearly or quite exposed is first to place in the bottom of the cavity a thin piece of asbestos paper, of proper size, with some Canada balsam, and then cement over it. As to killing every pulp found exposed, I think it very improper treatment.

## UNION CONVENTION IN BUFFALO.

(Continued from page 1010, volume xxxvi.)

### FIRST DAY—*Evening Session.*

THE convention was called to order at 8 P.M. Dr. W. W. BELCHER, of Seneca Falls, N. Y., read a paper, of which an abstract follows, on the subject—

### THE RELATION OF NITROUS OXID AND ASPHYXIA.

The year 1844 marks an epoch in the history of mankind Just fifty years ago the anesthetic properties of nitrous-oxid gas were discovered. From the day of its discovery it has ever been a mooted question whether or not this agent was a true anesthetic or an asphyxiant. To the unprejudiced observer it would appear that the discussion, *pro* and *con*, has been decidedly in favor of the idea of asphyxia. Numerous dissections of persons dying under the influence of nitrous oxid, and many domestic animals sacrified for the benefit of science, have tended to confirm this view. The medical profession have accepted it as an established fact; to a large number in the dental profession, however, it is still an open question.

In discussing this agent, it is claimed by the advocates of true anesthesia that there is an atomic separation of the elements of nitrous oxid, and that free oxygen and nitrogen each exert a special influence in the production of the anesthesia; in short, that nitrous oxid produces its effect by an overstimulation, an excess of oxygen in the system. On the other hand, the possibility of a separation of the elements of the gas at the normal temperature of the blood (98° F.) is positively denied; the nitrous oxid giving up no oxygen to the blood or tissues, the gas becoming rapidly diffused and replacing the oxygen in the lungs. Some writers go so far as to claim that this is not only true of nitrous oxid, but of all anesthetics; the agent, whatever it may be, gradually replacing the air in the lungs, and a state of asphyxia resulting. But when fifteen per cent. oxygen plus eighty-five per cent. gas is given, the blood preserves its normal amount of oxygen.

It is generally admitted that in producing unconsciousness nitrous oxid gives many of the symptoms of asphyxia. The quick and labored breathing, the increased rapidity of the pulse, the capillaries surcharged with discolored blood; the purple, aye, the black condition of the features under prolonged anesthesia,—these are all symptoms of asphyxia. We are all anxious to consider nitrous oxid as absolutely harmless. To be sure, there have been comparatively few deaths, and it cannot be said that every death is due to the anesthetic. Sudden and unaccountable deaths during surgical operations were not unknown before the advent of anesthesia.

In the course of a series of interesting experiments to determine the effect, if any, of the will power and physical condition on the amount of gas necessary to produce the anesthetic effect, I was tempted to try the experiment of breathing and re-breathing the same air. For this purpose an ordinary gasometer was used, the air being expired into the holder, and taken again into the lungs. The effect and the similarity of the symptoms to those of nitrous oxid were, to say the least, surprising. You will find yourself slowly losing control of your actions ; a numbness stealing gradually over you ; the sounds are re-echoed. At first you would dearly love to take a full breath of air ; *now*, it is a matter of indifference whether you breathe the fresh air or the contaminated atmosphere, which seems to be thick, a substance to be weighed and measured. A few more inspirations, and you are unconscious. I have done this not once, but many times. Every sensation was identical to that produced by the inhalation of the gas, even to the stertorous breathing. It is not claimed that producing unconsciousness in this manner is either new or novel. Indeed, it is most ancient, the inhaling of carbonic acid having been used by the early Egyptians to produce unconsciousness. It is no more or less than carbonic-acid poisoning. Speaking in the generally accepted meaning of the term, it is none the less asphyxia.

The word asphyxia, in its literal acceptance, was applied in days gone by to every state of apparent or real death, in which there was a primitive absence of pulse and cessation of beating of the heart. Since the action of the heart continues in asphyxia after the cessation of all other vital phenomena, it is evident that the word asphyxia is an improper expression.

Asphyxia may be confounded with apnea, suffocation, syncope, shock, dyspnea, and other disorders of respiration. Poisoning by toxic vapors, the fumes of sulfurous acid, mephitic gases in general, and those produced by burning charcoal (carbonic oxid, CO) do not constitute asphyxia in the literal acceptance of the word. They are, in fact, true poisons, resembling narcotic poisoning. As another interesting experiment, turn into the gasometer a small amount of nitrous oxid, say a gallon or two ; breathe the same until the gas is consumed. Breathe next into the gasometer, breathing the same air over and over. You will have without interruption a continuance of the anesthesia, and exactly the same train of symptoms as with the nitrous oxid alone. Try still another experiment ; breathe the same air over and over as before. When you begin to feel the effect, turn a small amount of nitrous oxid into the gasometer. You will find that ofttimes one gallon is sufficient to produce unconsciousness ; all the symptoms, the effect, absolutely the same as when nitrous oxid alone is employed.

I have tried these experiments, and many others, of which I will not attempt to go into detail, not once, but many times, and can arrive at but one conclusion : that asphyxia or carbonic-acid poisoning, call it what you may, and the effect of inhaling nitrous oxid are one and the same. I do not expect that the inhaling of an atmosphere surcharged with carbonic acid will ever take the place of nitrous oxid. The gas is far more pleasant in its action ; it must possess other virtues that make its asphyxiating effect more pleasant, a most charming method of smothering. That, its nature being asphyxiating, it is dangerous to any one having heart or lung trouble, no one will deny. Another fact : it takes much less effort to produce unconsciousness when gas is employed late in the day, when the vital forces are low, and the patient will complain of "an all-tired-out" feeling, and you will find two-thirds the amount of gas usually employed sufficient.

I have heretofore followed the generally accepted practice of preferring to have the patient early in the morning, fresh and unwearied from the cares of the day. Undoubtedly this is an advantage when you have a very nervous person to deal with, and the thoughts of the operation make him completely unnerved ; but when the person is not afraid of the gas, I would prefer late in the afternoon. Many cases have come under my own observation in which the same patient required three or four gallons more gas in the morning than on the previous afternoon.

A word in regard to our apparatus. The nice, checked red and blue cloth-covered tubes commonly used are a nuisance, a delusion, and a snare. The cloth only serves to cover the imperfections of the rubber. Some time when you have a dull day, carefully examine the tube you have been using for four or five years, count the imperfections, and then wonder at your ill success. A plain rubber tube is much better,—the rubber stretched *over* the inhaler and *over* the opening from the receiver. Our inhalers have too many joints, too many chances for leakage.

In conclusion, gas carefully administered is the safest agent in use for producing unconsciousness ; it *is* asphyxiating, to be used with caution. Remember that life rests upon a tripod, formed by innervation, circulation, and respiration, and the reciprocal action of these functions is demanded for the maintenance of life, death ensuing upon their cessation. No man has the right to jeopardize the life of a fellow-being for a minor operation such as the extraction of a single tooth.

### *Discussion.*

Dr. F. W. Low, of Buffalo, in opening the discussion, said that it was hardly true that the medical profession generally agree that anesthesia from nitrous oxid is the same as asphyxiation. If the nitrous oxid is administered under an air-pressure of two atmospheres, anesthesia is produced without asphyxiation. Hæmoglobin placed in an exhausted receiver will exhale atmospheric air. Speaking of Dr. Belcher's experiment with exhaled air, he said, "I want to caution him about pursuing his investigation too far. Asphyxia by $N_2O$ is undoubtedly less dangerous than by expired atmosphere. There is danger that he may have his insatiate thirst for knowledge gratified, and it will be some other fellow's turn to sing 'I want to be an angel.'"

He reported a nearly fatal case of nitrous-oxid narcosis in his own office, in which Dr. Fell's apparatus for forced respiration saved the life of the patient. This patient was a nurse, and was in an exceedingly nervous condition from the effect of pain and loss of sleep. When about six gallons of gas had been administered, the patient went under the influence kindly, without any bad symptoms. Having extracted the tooth, the lower left third molar, he waited what he thought was a sufficient time, and, as the patient did not commence breathing, he pressed in her ribs and then let go, this being his usual way to start respiration. He repeated this operation, but as the breathing did not recommence he became alarmed, and, having sent for medical assistance, he placed a pillow on the floor and laid the woman upon it and tried the Sylvester method of artificial respiration; after a while, on feeling her pulse, no pulsation was perceptible, and the ear at the chest showed very poor heart-action. Efforts to restore respiration by administering nitrite of amyl, etc., were resorted to without success.

After about twenty minutes an ambulance arrived, and the surgeon's report reads as follows:

Miss G., 28 Emerson Place. Age twenty-five; occupation, nurse.

Paralysis of respiratory centers, due to over-anesthesia. Fell's apparatus. Digitalis ♏. 15, strychnin gr. $\frac{1}{30}$. Recovery.

A very remarkable feature of the case was the fact that the patient retained consciousness through it all; heard and remembered what was said and done, but could not breathe. The ambulance surgeon administered digitalis and strychnin, as shown by his report, and then by means of the face-mask and Fell's apparatus produced artificial respiration for about twenty minutes, when natural breathing commenced, and soon after the patient was removed to the hospital.

The patient herself gives the following history of the case:

OCTOBER 26, 1894.

During the latter part of February, 1894, I was taken with a paroxysmal pain of a sharp, darting, stabbing character, which was attended with increased lachrymation, and when masticating food it was so intensified that I was compelled to resort to a liquid diet. The pain seemed to commence over mastoid, and extend over temporal and supra-orbital regions.

I was treated by a prominent physician during March and April, with but little or no effect. He then recommended the removal of a section of the supraorbital nerve, but circumstances would not permit of an operation, so it was postponed.

The first week in the following May I had several teeth filled, when the pain ceased until the last week in July, when it returned, apparently with greater severity. A near physician was called, who advised the same operation as mentioned above.

On the sixth night after the return of the pain the lower left wisdom-tooth (which was one of the number filled in May) began to ache, and the gum became swollen in a few hours. The physician advised its removal, thinking it was aggravating the pain in my head, and also advised my taking gas on account of my weakened and nervous condition from loss of sleep, etc.

On the morning of July 30, I called with a friend at the office of Dr. L., stating to him the history of my case, and also that from four o'clock the physician had given me ¾ gr. morphin hypodermatically. During the six years previous to this I had taken gas four times without any ill effects.

When the gas was being administered I never lost consciousness, but distinctly heard Dr. L. tell the lady in attendance when to turn the gas off, saw him take the forceps, and expected to experience pain during the extraction, but, to my surprise, I did not. I was still greater surprised to hear Dr. L. say I was not breathing.

I did not feel choked or smothered, but did feel tired and exhausted. I realized everything around me, but was unable to speak or move a muscle.

Since the extraction of the tooth I have not had any further trouble with the pain in my head.

MISS G.

Dr. Low then read from the DENTAL COSMOS (October, 1894, p. 839) the description of Dr. Hewitt's apparatus for administering nitrous oxid and oxygen. He had expected to have this apparatus to exhibit at the convention, but could not get it in time. He introduced Dr. George Fell, of Buffalo, who originated the forced-respiration apparatus of which he had spoken.

Dr. FELL spoke of cases of death under anesthesia and from the effects of narcotic poisons resulting from the paralysis of the respiratory centers, and believed that many such cases could be saved by the use of his apparatus. It is also useful in cases of diphtheria ; he mentioned a case where the child was unable to breathe and was unconscious, and the face had become thoroughly cyanosed, but the use of forced respiration and tracheotomy saved the life.

He had not much faith in the Sylvester method of artificial respiration, except as a temporary measure ; but he felt grateful for it, as it had enabled him to save a life by preserving the vital spark till he could be called and get his apparatus at work. In this especial case the forced respiration was continued with a few periods of natural breathing for fully seventy-three hours before natural breathing was permanently restored.

This apparatus consists of a foot-bellows, rubber tube with valve, and a face-piece and tracheotomy tube. The bellows forces air into the lungs, and the natural contraction of the lungs forces it out. There is perfect control of the air-current by the valve, so if the patient makes an effort to breathe the apparatus will assist him by changing from respiration to inspiration, or *vice versa*, instantly. In most serious cases it is better to perform tracheotomy rather than to use the face-mask.

Dr. BELCHER spoke of the advisability of using oxygen in connection with nitrous oxid as an anesthetic, and quoted a writer reported in the *Medical Annals*, who used an excess of seven per cent. of oxygen with nitrous oxid, producing anesthesia without any of the unpleasant symptoms frequently observed when nitrous oxid is given alone ; also another who used twenty per cent. oxygen with nitrous oxid, and found this entirely overcame the unpleasant symptoms usual with nitrous oxid.

Dr. J. B. WILLMOTT, of Toronto, Canada, asked if any one present could tell whether the action of nitrous oxid was modified when administered in high altitudes ; for instance, in places like Denver.

Dr. F. A. GREENE, of Geneva, said that in every case of accident from the administration of nitrous oxid or other anesthetics the dentist always gets frightened and sends for medical assistance, and asked, Why would it not be better to have a physician in attendance before the gas is administered?

Dr. LOW, in reply, said for his part he would not want to scare the patient to death by having a doctor present, and beside the percentage of accidents is so very small that he did not think it necessary.

Dr. FELL, who, while this discussion was going on, was making his apparatus ready, now demonstrated its use. He had arranged what he called an artificial lung, it being an elastic receptacle into which the air was forced, and from which it was pressed out by its own elasticity. He also showed the face-mask used when tracheotomy was not considered necessary. This resembled the face-piece of an inhaler as used by dentists, except that it was much heavier and was without valves, the valve being in the tube and controlled by the operator's hand.

Dr. LOW said, in the case of the lady who had received treatment in his office, that her dress was opened to allow freer movement of the chest, and when the forced respiration was in action there was a zone just above the diaphragm, about the width of two or three fingers, which responded to the apparatus, rising as the air filled the lungs, and falling as it was breathed out. He thought that the apparatus was used for about twenty or twenty-five minutes, and appealed to Dr. Butler, who had been present, to confirm him.

Dr. C. S. BUTLER, of Buffalo, said the apparatus was used about twenty-five minutes. There was one peculiarity about the recovery which he noticed. The patient had appeared to rally when the apparatus was first used, and then went down again, but the surgeon administered a hypodermic injection of strychnin, when she immediately rallied and continued to improve till she was able to be moved. Another remarkable thing was that the patient was conscious all the time; though more than once after she was placed on the floor she was apparently dead, still she heard and understood every word said by those around her.

Dr. FELL said that patients who are absolutely unconscious when the apparatus is applied generally become conscious long before they are able to resume natural breathing, and remain conscious or semiconscious till recovery is complete.

Dr. WILLMOTT asked if there was not interference of the epiglottis in the use of this apparatus.

Dr. FELL said yes, sometimes, when the face-mask is used; but by putting a ligature through the tongue and pulling it up, that was avoided. In extreme cases of narcosis it is better to resort to tracheotomy, as besides avoiding that trouble, food and remedies can be administered through the mouth without interfering with the forced breathing.

Dr. L. S. GOBELL, of Rochester, asked what would be the effect upon the kidneys of an overdose of nitrous oxid.

Dr. FELL said in cases of opium-poisoning the kidneys were not injured, and they eliminate the poison from the system to the extent of their ability, so that it is necessary to catheterize the patient sometimes repeatedly during the operation of forced breathing. He thought nitrous oxid would be the same.

Dr. C. S. BUTLER protested against the assertion that had been made, that not one dentist out of twenty was qualified to administer an anesthetic; but still, for their own protection when an accident occurred, no matter how well qualified, they were anxious for the presence and the assistance of a physician.

Dr. LOW asked Dr. Fell if he did not think, as the anesthetic effect from nitrous oxid was very short, that the face-mask would be better in such cases than to perform tracheotomy.

Dr. FELL answered that he did think so.

The subject was passed.

Dr. S. ESCHELMAN, of Buffalo, read a paper, of which an abstract follows, entitled,—

## THE ETIOLOGY OF PUS-FORMATION.

In studying the subject of suppuration, the question naturally resolves itself into that of the production of pus. A liquid of a thick, creamy, opaque, yellow-white color, slightly viscid, having an alkaline reaction and a specific gravity of 1030 to 1033, and composed, like the blood, of a liquid portion which it strongly resembles in its constituent elements, and, like the blood, of a second part made up of corpuscular elements.

If we study the phenomena of inflammation proper, it may at first thought strike you as strange when I say that as I understand the inflammatory phenomena, they are but the exalted or rather perverted phenomena of normal nutrition ; that is to say, nature, in its ceaseless activity of growth and repair, calls forth the same phenomena as are noticed in inflammation. We have the same dilatation of the capillaries, the wandering out of the white corpuscles, an effusion of the liquor sanguinis, and the same destruction and regeneration of cell-life ; and the seat of inflammation, like that of nutrition, has its greatest point of activity about the capillary blood-vessels. Thus, after a full meal we get determination of blood to the stomach, with an increased flow of gastric juice ; in great mental activity we get dilatation of the capillaries of the brain, with increased cell-activity and an increase of heat. Again, in physical exercise, when the muscles are called into energetic action, the heart's action is increased, the capillaries become dilated in the parts exercised, as can be observed superficially by the flushed condition of the face. There is also a rise of temperature, with increase of cell-activity. Now while in nutrition we have some of the phenomena of inflammation manifest, they are not progressive, but are merely sufficient to supply the normal growth of the system, and replace the normal waste, which is necessary for the carrying on of the normal functions of the body.

Now let this physiological irritation become a pathological irritation, the function of the cell or collection of cells to form organs, which in the former were simply increased, in the latter become disturbed, and produce an altered or disturbed condition which may be considered as a progressive process, but which as yet is not necessarily increased so as to cause inflammation, but may be sufficient to lead to hyperplasia or tumor-formation. Thus, repeated irritation from friction or slight injury causes a thickening of the epithelium on the hands of the laborer ; corns are similarly produced.

Again, if the irritation be more pronounced, as in traumatic injury, the regenerative processes necessary to repair the injury will develop the first stages of an inflammation, but if kept in an aseptic condition will show no tendency to spread beyond the part first injured, nor will it pass on to a more advanced stage after the cause of the injury has ceased to act.

Everybody knows how slight are the inflammatory changes produced by severe fractures and subcutaneous injuries, if secondary causes are excluded. Huter injected a five per cent. solution of nitrate of silver or chlorid of zinc into the muscles and tissues of animals, quite killing the part acted on, and found that a large number of the cases experimented upon showed no signs of the inflammatory condition extending beyond its first stage.

Since an injury in itself is not sufficient to disturb the phenomena of nutrition so as to develop and carry the inflammatory process beyond its regenerative stage, progressively through the suppurative stages to the production of pus, there must be some direct irritating cause, which when directly introduced into the tissues multiplies, is destructive to cell-life, and by its continuous action is capable of exciting the inflammatory action and developing it to the production of pus.

This cause we have in the pathogenic bacteria.

"It is a well-known clinical fact that the highest type of tissue-vitality is unfavorable to the development or the retention of bacteria in the system for a long period of time. While it has been definitely ascertained by experimental researches that many of the pathogenic bacteria are harmless as long as they remain in the circulating blood, and that their specific pathogenic activity only becomes evident after localization has taken place in some part of the body, in a soil prepared by injury or disease for their production, it has also been conclusively shown by clinical experience that pathogenic spores may remain in the healthy body in a dormant condition for an indefinite period of time, until by some accidental pathological changes the tissues in which they may exist have been prepared for their germination."

Fodor introduced pathogenic bacteria directly into the circulation of rabbits, observing their effects upon the healthy tissue, and the way in which they are eliminated. Generally they had disappeared from the blood-current after twenty-four hours. He believed the blood-corpuscle destroyed the bacteria while circulating in the blood-current.

Watson Cheyne's experiments led him to the conclusion that the living tissues, when in a healthy condition, are not favorable to the development and existence of bacteria.

The rapid disappearance of disease-producing bacteria from the blood, when injected into the circulation of healthy animals, goes to show that healthy serum has marked antiseptic properties; also that the blood-corpuscles take an active part in their destruction. If some of the bacteria are not destroyed in the blood, but pass through the capillary blood-vessels and come into direct contact with the fixed tissue-cells, a struggle for supremacy again takes place between the bacteria and the fixed tissue-cells. But if phagocytosis does not prove successful in destroying the bacteria which have entered into the system, nature still has a way in which to combat them successfully,—viz, elimination through one or more of the excretory organs.

The critical discharge of the old writers—profuse sweating, diarrhea, and copious discharges of urine—receives a different meaning in the light of modern bacteriological researches, as they are now considered the way which nature takes to rid itself of the pathogenic bacteria and their products.

That bacteria are eliminated by the kidneys is shown by various observations, and as Cheyne points out, this offers a reasonable solution for certain cases of pyelitis in patients who have never had any instruments passed, and whose urethras and bladders are normal. Philopowis produced tuberculosis in animals by injecting urine taken from tubercular patients into the peritoneal cavity. Schweigger, by his bacteriological researches, shows that the urine of scarlatinal patients is contagious.

Since we know that bacteria are the cause of disease, and that the system, when in perfect health, is capable of resisting the exciting causes, conditions must manifest themselves so as to predispose and prepare the system for the localization of pathogenic bacteria.

General depression of vitality has for ages been considered a predisposing cause of suppuration.

Local depression of vitality is another cause more easily recognized. If a part has been deprived of its proper supply of blood for a time, bacteria develop more readily in that part.

Injury is another predisposing cause of suppuration. First, by exciting the first stages of an inflammation; second, by causing an effusion of blood and allowing the pathogenic bacteria to escape from the circulation, so as to find a suitable soil for their development. The first stages of an inflammation are decidedly the most important conditions that produce local depression of vitality, so as to furnish a suitable *locus minoris resistentiæ* for bacterial development. The first stages of an inflammation favor the suppurative process by bringing the tissue-elements of the inflamed area in such a relation to the blood-vessels as to impair or destroy their nutrient supply. In active inflammation the intercellular spaces soon become so crowded with leucocytes and red blood-corpuscles as to cause dilatation of these spaces and pressure upon the capillary vessels, as often to result in stasis and an arrest of blood-supply. As a result of such suspended nutrition, the leucocytes lose their power of resisting the action of the bacteria by undergoing coagulating necrosis. Again, it is safe to say that all conditions that impair cell-nutrition, whether local or general, favor the suppurative process.

That pathogenic bacteria are the direct cause of suppurative inflammation and the production of pus has been well established by clinical observations and experiments. Clinical surgery has, during the last two decades, shown that suppuration in wounds can be prevented when means are taken to destroy, remove, or exclude the bacteria from the wounds.

It is proven conclusively that the pus-producing bacteria can be cultivated from the pus of every acute abscess, and that the injection of pure cultures in sufficient quantities is always followed by suppuration.

The effect of inoculation with pus-producing bacteria will depend on the quantity of bacteria introduced, and the general and local susceptibility of the subject.

In the study of the growth and reproduction of cell-life, we find that it receives and assimilates food. When certain substances which serve as food are received into the cell they are in a large measure dissolved and become part of the body of the cell; and with their reception and assimilation there is at the same time going on an ejection or excretion of elaborated material.

With the growth and multiplication of bacteria there is this same functional activity of cell-life taking place,—the same reception and assimilation of food, and the same excretion of elaborated waste-products, which by modern bacteriologists have been called ptomaines. These are alkaloidal bases, closely resembling vegetable alkaloids, and in one or two instances were found to be isomeric with them.

It would be a very interesting scientific fact to know just how pathogenic bacteria produce their peptonizing action on the albuminoid elements of the tissues, so as to produce pus. Whether the death of the tissues is due to their assimilative action, in which they split up the albuminoid and other elements so as to form new compounds; or is it due to their excreted products, the ptomaines, which destroy and liquefy the tissues so as to allow of their growth and reproduction; or is the action a two-fold one, the ptomaines killing the tissues, and the assimilative action splitting up the tissue-elements into new compounds? Grawitz and De Bary, from their experiments with the ptomaines of pathogenic bacteria, believed that like chemical irritants they prepare the tissues for the growth and reproduction of pus-producing bacteria. The action of these ptomaines was studied by injecting sterilized cultures of pus-producing bacteria, in which the active agent could only be the preformed ptomaines. These experimenters injected four cubic centimeters of a sterilized culture of Staphylococcus pyogenes aureus under the skin of a dog, with the result of producing suppuration Examination of the pus thus produced showed no bacteria. Grawitz also experimented with a pure preparation of cadaverin, a two per cent. solution of which killed the Staphylococcus pyogenes aureus in an hour, and a small quantity added to a culture of pathogenic bacteria arrested their further growth.

Scheuerlen was the first to study the local effects of ptomaines on the tissues. He introduced into subcutaneous connective tissue of rabbits, aseptic glass capsules containing a sterilized infusion of meat. The wound healed by primary union. As soon as the capsule became encysted he broke both ends of the capsule, so as to allow its contents to saturate the surrounding tissues. From three to six weeks after the implanting of the capsule an incision was made down to it, and a thorough examination of the tissues was instituted. In the ends of the capsule were always found a few drops of thin, yellow liquid, which under the microscope showed all the characteristics of pus. The surrounding tissues showed no signs of inflammation. Inoculation of culture-media with the fluid developed no bacteria. In about twenty experiments the pus was always found inside the capsule. Again, Klemperer made thirty cultures of the Staphylococcus pyogenes aureus, and the same number of the Staphylococcus pyogenes albus, and on completion of their growth, fourteen days later, he sterilized them with boiling water, and after shaking the fluid removed the cultures and boiled them for a few minutes, and finally filtered them; thus obtaining fifteen cubic centimeters of a light yellow fluid, which was further reduced by boiling to eight cubic centimeters, and again filtered before using. The material thus obtained was put into glass capsules and the ends hermetically sealed. They were then, under strict antiseptic precautions, inserted into the subcutaneous connective tissue of animals. The suppuration following the breaking of the ends of the capsules in these cases was again found to be limited to the space within the capsules, being caused by the action of the preformed ptomaines on the leucocytes and fixed cells, which found their way into the interior of the capsules.

These experiments go to prove that the ptomaines of pathogenic bacteria exert a chemical action on the leucocytes and embryonal cells, by which they are converted into pus-corpuscles. The suppuration produced by these experiments never extended beyond the tissues which were brought in contact with the ptomaines. It always remained circumscribed, and did not show the progressive character noted in clinical suppuration.

There are a number of investigators who claim that suppuration can be produced artificially in animals by injecting into their tissues certain chemical agents, such as metallic mercury, turpentine, and croton oil.

On the other hand, such men as Scheuerlen, Rings, Strauss, and Klemperer, from their experiments, after having used extreme antiseptic precautions, have come to diametrically opposite conclusions, —viz, that under no condition does simple chemical irritation give rise to the formation of pus. Cheyne, in summing up the evidence pro and con, concludes that the difference of opinion is due to the fact that the pus-like mass of slowly dissolving dead cells and fibrin which some observers have called pus is not considered such by others ; and he agrees that true, creamy pus is never found in man apart from bacteria. When we reflect for a moment how difficult it is in experimenting upon animals with chemical compounds, and to procure for the seat of the injection a perfectly aseptic condition, it will not be difficult to understand that opinions still differ in reference to the direct and essential cause of suppuration.

If we grant that some chemical agents are capable of producing pus, it is not true or clinical pus, and it contains no bacteria, is aseptic and sterile. Its cause cannot be developed, like true pus, upon different culture-media, and, when again introduced into the tissues, develop suppuration. It is only obtained in the experimenter's laboratory at the cost of extreme care. We may conclude, then,—

1. That suppuration is a progressive process which starts from the phenomena of nutrition and passes through all the stages of inflammation to the death of the cellular elements and liquefaction of the inflammatory products, so as to produce pus.
2. That simple traumatic or phanerogenetic inflammation is in itself incapable of passing on to the more advanced stage of suppuration.
3. That pathogenic bacteria are the essential and direct cause of suppuration ; and that by their growth, development, and formed ptomaines they are capable of initiating the inflammatory phenomena, and developing them successively through all the stages to the production of pus.

(To be continued.)

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## CONNECTICUT VALLEY DENTAL SOCIETY.

At a meeting of the Connecticut Valley Dental Society held June 20, 21, and 22, 1894, on a question of discipline, a discussion arose as to how much a member could advertise and not violate the code of ethics. As a result of the discussion a committee was appointed with instructions to report at the next meeting of the society an interpretation of the code of ethics.

At the adjourned meeting held October 25, this committee through its chairman, Jas. McManus, D.D.S., of Hartford, Conn., submitted the following report:

Sixty years ago there were a few men practicing dentistry in this country who could justly be called professional men. Among the number were several who had a medical education, and they with others were the organizers of the first dental society and dental college. The first circular issued by that college was to this effect, that hereafter dentists ought to be, and should be, liberally educated, and skillfully trained to become competent dental surgeons. This was the first movement made by practicing dentists to elevate the standard of dental education and practical requirements, and the college faculty was the first to give notice to the public that in future educated dentists would be entitled to rank as professional men, and their calling raised to the dignity of a profession. Every man in the practice of dentistry since the first dental college was established decided for himself when he commenced to practice whether he wished to be considered a professional man by the community where he located. Whether dentistry was to be considered a profession or a trade, depended entirely on the course pursued by each practitioner. There have been, and probably always will be, quacks and pretenders in the medical profession and pettifogging "shysters" in the legal profession, but they are not regarded as professional men, however much they may claim to be so considered. They may be, and often they are, men of some skill and education; but their manner of conducting their business bars them out from fellowship in professional societies. When men associate together in any vocation, they consciously or unconsciously subscribe to a code of ethics. The bankers and brokers have local societies in this country, but they are not yet as strict in their rules as the London Stock Exchange, as will be seen by the following published notice which I will read to you:

THE STOCK EXCHANGE.

NOTICE.

No Member of the Stock Exchange is allowed to advertise for business purposes, or to issue circulars to persons other than his own principals.

Persons who advertise as Brokers or Share Dealers are not Members of the Stock Exchange, or under the control of the Committee.

A List of Members of the Stock Exchange who are Stock and Share Brokers may be seen at the Bartholomew-lane Entrance to the Bank of England, or obtained on application to FRANCIS LEVIEN,
Secretary to the Committee of the Stock Exchange.
Committee Room, The Stock Exchange, London, E. C.

The various art leagues and other organizations that have been established, such as the Order of Mechanics, the Brotherhood of Engineers, the Trades Unions, and the many other societies that include every trade or occupation by which men and women earn a living, all have rules by which they are governed, and that must be faithfully lived up to by all who wish to enjoy the benefits and privileges of membership. There are many orders and lodges, such as the Masons, Odd Fellows, Knights of Pythias, and other benevolent societies, which, if a man wishes to join, he is supposed to first read the laws that are in force governing them, and know just what is expected of him before he signs his name as a member.

A man may possibly lead a pure and honest life, and yet never be seen to enter a church. If, however, he should chance to join a church he is expected to conform to the articles governing that church; but if after joining he never attends the services and takes no part in the duties devolving on its members, he can hardly expect his neighbors to call him a model Christian.

A man may be educated for the practice of medicine or dentistry, and be well fitted to practice successfully; but if he is never seen associating with his professional brethren, or is known to keep aloof from professional societies, and conducts his business in an unprofessional manner, he gives to the community where he practices good reason for considering him outside the professional fold.

The associations and organizations, including the religious and professional societies that I have mentioned, each have laws governing them that are practically codes of ethics.

The American Dental Association adopted a code of ethics over twenty-five years ago.

Every dentist should read the code very carefully, and know what he agrees to do when he becomes a member of a dental society. There is a very general mistake made in thinking that the code seeks only to regulate the question of advertising. It points very clearly to other duties that are even of much more importance, and that are frequently unconsciously transgressed by those of the best intentions.

All societies that pretended to live up to this code were invited to send delegate members to the American Dental Association, and later to settle the question as to who were properly eligible. The association at the meeting held in New York city in 1881 adopted the following resolution:

> *Resolved*, That hereafter no society shall be entitled to representation in this association that does not require its members to live up to the requirements of our code.

There is nothing in the code that calls for any sacrifice on the part of any practitioner who wishes to be known as a reputable professional man. It does ask you to labor earnestly to extend the sphere and usefulness of your profession, and to maintain its honor, to give honest advice and treatment to patients; and you are counseled to be charitable in your remarks when passing judgment on the results of the labors of your professional brethren, and to live in a manly, honest way, "doing unto others as ye would they would do unto you."

If the Connecticut Valley Dental Society desires to hold its rank among other societies, and cares to retain its past well-earned good name, it must uphold and demand that its members live faithfully up to the code.

The committee has carefully considered the different sections of the code of ethics, and finds no reason for suggesting that any changes be made in its wording or construction, neither does it think it necessary to put any interpretation on its provisions. The committee is of the opinion that hereafter all matters requiring investigation or discipline should be left entirely to the discretion of the executive committee, so that valuable time may be saved for society work. The committee, therefore, offers for your consideration and adoption the following resolution :

*Resolved*, That the executive committee be instructed to investigate all cases of violation of the code of ethics reported to them, and that they take such action as they deem just ; the one feeling aggrieved having the privilege to appeal to the society for reinstatement.

Report accepted, and resolution unanimously adopted.

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# DENTAL SOCIETY ANNOUNCEMENTS.

## TRI-STATE MEETING.

THE joint meeting of the Dental Societies of Ohio, Michigan, and Indiana will occur June 18, 19, 20, 1895, at Detroit, Michigan. The dental department of the Detroit College of Medicine and Surgery has been secured for the sessions. Michigan has generously invited her sister states to share her hospitality and be her guests on this occasion. The program contemplates four literary sessions, two half-days of clinics, and one half-day of "hurrah." This latter will come in the form of an excursion, thirty-two miles up the Detroit River to the St. Clair Flats, where we will dine at one of the club-houses built on piles in the middle of Lake St. Clair. Special hotel and railroad rates are assured, and will be announced later. The railroad fare will be at least as low as one and one-third fares. All reputable dentists in the three states are cordially invited to attend.

By order of the Executive Committee.

## LOUISIANA STATE DENTAL SOCIETY.

THE annual meeting of the Louisiana State Dental Society is placed for February 26, 1895, at New Orleans, the day following "Mardi Gras." Those who have not attended the carnival at the "Crescent City" can avail themselves of the opportunity of attending both the meeting of the society and the Mardi Gras. A very large attendance is expected, and numerous papers will be read. The dental profession is cordially invited.

H. A. TRUXILLO, D.D.S., *Cor. Secretary.*

## THE HORACE WELLS MEMORIAL.

THE chairman of the Executive Committee of the Horace Wells Fiftieth Anniversary Celebration announces that the papers read by Professors Fillebrown and Garretson at the meeting, and the speeches delivered at the banquet, have been prepared for publication in the proposed souvenir volume, and will be issued upon the receipt of a sufficient number of subscriptions to cover the expense. Price, $1.50.

The undersigned will receive subscriptions, receipt for same, and deliver the book upon completion.

J. D. THOMAS, *Chairman.*

912 Walnut St., Philadelphia, Pa.

## VERMONT BOARD OF DENTAL EXAMINERS.

THE next annual meeting of the Vermont Board of Dental Examiners will be held at the Brandon House, Brandon, Vt., Wednesday, March 20, 1895, commencing at 2 o'clock P.M.

R. M. CHASE, *Secretary*,
Bethel, Vt.

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# EDITORIAL.

## LEGAL RESTRICTION OF NOSTRUMS.

WE learn with much satisfaction that a movement has been set on foot in Mississippi having for its object the prohibiting, by legislative enactment, of the use of nostrums in connection with the extraction or filling of teeth.

Certainly the ghastly record of fatalities consequent upon the ignorant use of cocain preparations is long enough to demand a halt and that the use of this drug be placed on a clearly defined legitimate basis.

Cases of accident, fatal, or so nearly fatal as to constitute a grave menace to life, are almost daily reported in the use of the cocain preparations. The note of warning has been sounded by authorities in this matter whose experience entitles them to credence and full consideration. The record of fatal cases of cocain-poisoning which has been published by Dr. Mattison, of the Brooklyn Home for Habitues, is an unanswerable proof of the toxicity of cocain, and it shows, moreover, that the conditions which limit its safe use are by no means clearly defined.

If, then, we have such a narrow margin of safety in the use of cocain in accurately known doses, the use of a nostrum containing cocain in which the existence of the drug is either denied or is of unknown amount becomes little short of criminality. It certainly lacks but the one feature of statutory definition to make it so.

The indiscriminate use of cocain nostrums for the painless extraction of teeth, often by men who are ignorant of the most elementary features of the action of the drug, and the wholesale mutilation which such practice entails upon the community, is an open disgrace to our profession. The time is fully ripe, by reason of the known dangers incident to such practices, for securing a proper legislative control which shall relieve the community of this menace to life and health, and the dental profession from a blot upon its record. The plea that the ethical dentist does not use nostrums, even if true, does not relieve the legitimate practitioner from this obligation to see to it that they are not used by those who make no claim of allegiance to professional ethical standards. It is a matter which should receive the earnest consideration of our state and national associations. The mere passing of a resolution condemning the use of the nostrum is without effect upon either the traffic in, or the use of, these abominations. What is needed is that the matter be put into the hands of an earnest and intelligent committee, with instructions to secure state legislation prohibiting the injection of a nostrum into the human circulation. Restrictive legislation of this character is clearly within the constitutional right of the state under its police powers. If the case were properly prepared and brought before our legislative bodies, there can scarcely be a doubt as to a successful issue. Many of our state laws, in defining who shall practice dentistry within the meaning of the act, make the provision that no one shall be prevented by the act from extracting teeth. Advantage of this provision is taken by the nostrum charlatan with no proper knowledge of dentistry, to prey upon the ignorance of the community, and conduct a more or less lucrative business in the painless extraction of teeth. It has been suggested that the provision above noted, by virtue of which these quacks are allowed to go unmolested, could, by a strict interpretation, be used to bring their business to an end. As the proviso clause has reference only to the extraction of teeth, it only need be demonstrated to a jury that the injection of a drug into the circulation is an operation of possible danger requiring educated skill in the performance, and is a separate and distinct operation from the extraction of teeth, the only operation contemplated by the proviso. If such an interpretation of the act could be had, it would necessarily deprive the illegal quack of the only attractive feature of his business.

The main question, however, remains to be solved, and active measures should be undertaken to prohibit the injection of any unknown drug or drugs in unknown quantity into the circulation.

There is no excuse for the use of cocain nostrums. When the drug is used it should be used with full knowledge concerning it, and any properly educated practitioner either has such knowledge or has ready access to it. The continued use of cocain nostrums in the light of our present knowledge is simply paying high tribute to the greed of the nostrum vendor, and dallying with a source of danger which when its logical result in the shape of accident ensues should deprive the author of it of all sympathy from his colleagues or mercy from a jury.

## THE "DENTAL DIGEST."

In extending a welcome to this, the latest advent in our household of dental periodicals, we regret, for the reason that it makes its *début* under an impersonal editorial direction, that we are are unable to include its editor by name.

We believe there is a field for such a journal as the *Dental Digest* proposes to make of itself, and it should be successful in proportion as it adheres to the lines upon which it is projected. The initial number can hardly be presumed to be a fair sample of what may be expected in future, as the difficulties incident to launching a new journal must necessarily lead to the inclusion of some errors and inaccuracies which will not appear in later issues.

It is somewhat surprising to learn, for example, that "the *Dental Digest* is the child of necessity," and that "heretofore the body of dentists practicing in the United States have had no mouth-piece." Now, the body of dentists practicing in the United States is one of considerable magnitude, and already supports upwards of twenty periodicals, each of which is modestly making an effort to perform the function of mouth-piece for some fraction at least of the whole body. It may be true that they "are either controlled by dental-supply houses or are dependent upon the support received from their advertisements," but up to date the *Dental Digest* has not made it clear that it is either an exception to that general rule or that it has a sufficient oral capacity to fulfill the function of mouth-piece for the whole body of dentists in the United States. The *Dental Digest* is avowedly "published, controlled, and managed entirely by the Dental Protective Supply Company," a corporation created for the manufacture and sale of dental instruments and supplies ; and, in addition to its text, some thirty pages of advertisements are inserted. By reason of the facts noted, it does not seem evident that the *Dental Digest* is quite free from the impedimenta with which it saddles its contemporaries. These are matters which experience in the function of mouth-piece to the whole body of dentists in the United States will no doubt ultimately present in a modified light.

If the thought of the whole body of dentists in the United States is to be properly digested and then spread broadcast through the medium of this journal, we hope we may be pardoned for suspecting that a not inconsiderable portion of the manufacturing capacity of the Dental Protective Supply Company will be ultimately devoted to the manufacture of a suitable pepsin for the relief of the Dental Indigestion on the part of its offspring which must inevitably result from such an effort.

Irrespective of these features in its policy, we believe that the plan of the journal is a good one, and that it will meet with success upon its merits,—not in reliance upon a sentiment.

The first number contains an amount of matter in the shape of original communications, editorial matter, salutatory, and announcements which have relatively reduced the department which we understand is to be the distinguishing feature of the journal. This, we are told, is a matter of necessity in the first issue.

In the "digest" of the *International Dental Journal* for December, 1894, there is an error of fact. The statement is made that Dr. A. P. Brubaker, in his paper on "The Causation of Erosion," takes issue with Dr. James Truman, Dr. E. C. Kirk, and others as to the pathology of erosion. On the contrary, Dr. Brubaker confirmed the views taken by the parties named. This is clearly set forth in the essay, and is also confirmed by the editor of the *International* in the same issue, at page 796. We appreciate the fair critical spirit in which the bibliographical digest is made, and welcome the new journal to the ranks with most cordial and fraternal sentiments, wishing for it its full measure of success.

## "ANALES DE LA SOCIEDAD DENTAL DE BOGOTA."

THIS new journal is the official organ of the Dental Society of Bogota, Colombia, S. A., and is issued monthly under the editorial management of Drs. Carrasquilla and Restrepo. The *Anales*, besides regularly publishing the transactions of its patron society, proposes to furnish to its clientele a *résumé* of the progress of dentistry throughout the world, as set forth in its periodical literature. It believes that its readers will be benefited by such an exposition of the development of dentistry in "countries of greater advancement than ours."

We heartily concur in this belief, and in the following sentiment, which we quote from the salutatory, wishing the new journal much success in its undertaking :

"He that follows a profession like dentistry, and does not study nor read a dental journal, walks in a straight path to empiricism, anchors himself to a certain routine, and not only does not progress, but, on the contrary, retrogrades by rapid strides."

## CORRECTION.

THE following letter from Dr. Andrews explains itself. Dr. Patrick's report was printed in the DENTAL COSMOS for December, 1894.

TO THE EDITOR OF THE DENTAL COSMOS :

*Sir*,—Will you please correct a statement made in Dr. Patrick's report about the pre-historic skull found in Central America? It was found at *Labna*, and not at Labora, as stated in the report, by an expedition sent out by Harvard University. I had been informed that it was found by the Hemenway Expedition, but this was a mistake. The skull was photographed by Mr. M. H. Saville, who was with the expedition when it was found, and to whom I am indebted for many courtesies while examining the specimens at the Peabody Museum.

Very truly yours,

R. R. ANDREWS.

January 14, 1895.

# BIBLIOGRAPHICAL.

A SYSTEM OF ORAL SURGERY: Being a treatise on the Diseases of the Mouth, Jaws, Face, and Teeth, and Associate Parts. By Dr. JAMES E. GARRETSON. Illustrated by numerous woodcuts and steel plates. Sixth edition, thoroughly revised, with additions. Philadelphia: J. B. Lippincott Co., 1895. Pp. 1084. Price, cloth, $9.00; sheep, $10.00.

For twenty-five years this work has exerted a strong influence in the development of dentistry toward a higher plane and wider field of practice. The appearance of a new edition at this particular time is of especial interest as a reflection of the extent to which this development has proceeded. The field of stomatology is to-day as clearly defined a department of practice as were any of the specialties of medical practice a decade ago, or as some of them are even to-day. Garretson's Oral Surgery has maintained for a quarter of a century the position of a sound guide in the field of stomatology, and is to-day without a rival.

This book is both a system and a treatise. It deals with the material basis of its subject, and also with the principles relating to it. The amount of matter included in its pages is astonishingly large, and yet it is a marvel of condensation.

There is a systematic arrangement of sections following one another in rational sequence, and the chapters have a definite purpose in their order. The first section deals with the topographical and surgical anatomy of the parts, and is clear and comprehensive. The chapter on dentition remains unchanged; the points in which the author takes issue with the embryologists do not affect surgical practice. Those who hold gum-lancing to be an unwarranted and unnecessary procedure will find profitable reading in the tenth chapter. Here, as in other sections, the interdependence between the general and particular is broadly set forth. The chapters upon operative and prosthetic dentistry are rationally arranged, and while they may be open to criticism in some minor details, they are still to be commended as safe and trustworthy guides to intelligent practice.

The new surgical engine of Doriot is described and illustrated, together with the several improvements suggested by Dr. M. H. Cryer. The surgical engine has been for years identified with Dr. Garretson's clinics, and he shows how this instrument and its equipment of special tools renders practicable the delicate and ingenious operations performed by him.

The chapter on physical diagnosis has increased significance by preceding that on artificial anesthesia, for certainly it is desirable, perhaps essential, that those who administer anesthetics should be able to recognize conditions which would render the use of anesthetics dangerous.

It would be idle to compare this work with any other, for it is itself the basis of comparison of similar works.

To write a complete and critical review of a book of this character would require more space than could be devoted to it by any journal. That there are numerous details which might form proper subjects for criticism is simply to admit that the work is no exception to any other result of human endeavor. That it is easier to criticise such an effort than to produce its superior is evidenced by the fact that it is the only work of its kind in existence, and has enjoyed this distinction from its first appearance.

As a piece of bookmaking it is a worthy example of the best done in that line by its well-known publishers.

DENTAL MEDICINE. A Manual of Dental Materia Medica and Therapeutics. By FERDINAND J. S. GORGAS, A.M., M.D., D.D.S., Professor of the Principles of Dental Science, Dental Surgery, etc., in the University of Maryland, Baltimore, Md. Fifth edition, revised and enlarged. Pp. 580. Price, cloth, $4.00. Philadelphia, P. Blakiston & Co., 1895.

The present edition of this standard work exhibits a marked improvement upon preceding ones. A number of errors to which we called attention in our notice of the fourth edition have been fully corrected, and a careful reading reveals but few points for criticism. It is not clear why the chemical bleaching of teeth should be included under the heading "Diagnosis of Mouth Affections," and in the description of the process there are two errors which careful proofreading should have eliminated,—viz, in the description of Professor Truman's chlorin method, page 75, chlorid of lime (calcium hypochlorite) is designated calcium hydrochlorite ; and, again, page 76, in describing the sodium-peroxid process of bleaching, the term hydrochlorine acid is used for hydrochloric acid.

Dr. Charles Truman is still credited with the suggestion of combining iodoform and arsenious acid for the purpose of pulp-devitalization, notwithstanding that the author of that method, Professor James Truman, called attention to the error in a review of the fourth edition, in the *International Dental Journal*, December, 1891.

On page 543, in describing the dental uses of zinc chlorid, the following statements are made : "As it is not absorbed by the dentine to any degree, its action being superficial, it is not so dangerous an agent as arsenious acid when employed for the same purpose. In no case should the chlorid of zinc be used as an obtunding agent when there is danger of irritating the pulp." These two sentences are somewhat contradictory, and they need revision and qualification in the light of recent researches respecting the penetrating power of zinc chlorid. The difference between the irritating qualities of zinc chlorid and arsenious acid respectively is less dependent upon their relative penetrating power than upon their specific modes of action upon cell-vitality. It is about time, also, that all references to the use of arsenious acid as an obtundent of hypersensitive dentine other than condemnatory should be omitted from our text-books.

Many new medicaments are described in this edition, notably sodium peroxid, pental, europhen, aseptol, glycozone, coryl, ethyl chlorid, tropacocain, kalium natrium, trikresol, loretin, phenosalyl, formalin, diaphtherin, boracin, dermatol, vaselone, camphoid, gaultheria, catechu, carbolate of camphor, cocain phenate, sulfophenol, mono-chlor-ethene, tri-methyl-ethylene, di-iodoform, carbolized cosmoline, eugenol, acetanilide, electrozone, etc.

The changes in and additions to the text are considerable, and add much to the value of the work, serving to strengthen its well-merited position as a standard text-book on the subject.

TRANSACTIONS OF THE WORLD'S COLUMBIAN DENTAL CONGRESS. In two volumes. Edited for the General Executive Committee by A. W. HARLAN, A.M., M.D., D.D.S., assisted by LOUIS OTTOFY, D.D.S. Chicago, Illinois, press of Knight, Leonard & Co., 1894.

In these two volumes of upwards of eleven hundred pages, we have the permanent record of the effort which culminated in the holding of the World's Columbian Dental Congress at Chicago, Illinois, in August, 1893. Our readers are already familiar with much of the history of that effort and with some phases of the result, but no one unconnected with the movement can form an adequate idea of the magnitude of the undertaking and the obstacles that had to be overcome, or appreciate the brilliant climax presented by the Congress itself. The record which is now presented to the world in the finished report of transactions is complete and perfect, and constitutes the most important contribution of its class that has ever been made to the literature of dentistry. To criticism of whatever class or representing whatever grievances, real or supposed, with respect to the conduct, make-up, or management of the Congress, or respecting the manner or time of issuance of the official Transactions, these two volumes are a full and sufficient refutation.

Every dentist who hopes to keep in touch with the best that is being done in his profession should possess a copy of this magnificent work, and familiarize himself with its contents. The thanks and gratitude of the dental profession are due to the Secretary-General and his assistant, Dr. Ottofy, for the ability and skillful care which they have manifestly expended in the preparation of these volumes.

The Transactions may be had on application to Dr. John S. Marshall, Venetian Building, Chicago. Price, $10.00.

SAMMLUNG VON MIKROPHOTOGRAPHIEN ZUR VERANSCHAULICHUNG DER MIKROSCOPISCHEN STRUKTUR DER ZÄHNE DES MENSCHEN. Herausgegeben von Dr. dent. surg. A. GYSI und Dr. med. C. RÖSE. Selbstverlag von Dr. dent. surg. Alfred Gysi, Zahnartz in Zürich, Schweiz. Serie I. Price, $6.00.

This publication consists of a portfolio of twelve photomicrographs of sections of dental tissues, with explanatory text and drawings, showing the histological elements in detail. The work is beautifully done, and is a most important contribution to the subject. Plate II, showing the nerves of the pulp, is exceptionally fine. Plate VI is also a good one, but the drawing below it is hardly like it. Plate IX, showing a transverse section of dentine, is a very fine one, giving clear definition of the several parts of the structure.

In some of the plates the tissues appear to be shrunken,—*e.g.*, No. IV,—but all are of a high order of merit, and it is to be hoped that the publication will be continued until the series is exhaustively complete.

A comparison of the drawings with the photomicrographs presents an interesting example of the influence of the personal equation. In the one we have a photograph of the object as made by the camera, in the other a picture of the same object as it appeared to the observer. The lack of correspondence is quite manifest in some of the plates. We would suggest the substitution of the term photomicrograph for microphotograph as used in connection with this publication. The use of the latter in this connection is indefensible.

The work can be obtained from Dr. Alfred Gysi, Zahnarzt, Börsenstrasse 14, Zürich, Switzerland.

## PAMPHLETS RECEIVED.

Charity Organization and Medicine. By George M. Gould, M.D., Philadelphia. From the *Medical News*, October 13, 1894.

Speech Without a Larynx. By Harrison Allen, M.D., Director of Wistar Institute, University of Pennsylvania. From the *Medical News*, March 17, 1894.

The Etiology of Fracture of the Lower End of the Radius. By the same author. Reprinted from *University Medical Magazine*, December, 1893.

Rhinoliths. By the same author. Read before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, February 6, 1894. Reprinted from the *International Medical Magazine* for April, 1894.

Transactions of the American Academy of Dental Science. March 1 to December 6, 1893. Reprinted from the *International Dental Journal.*

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# OBITUARY.

## DR. WILLIAM O. KULP.

DIED, at Davenport, Iowa, January 12, 1895, of blood-poisoning, WILLIAM OVERHOLT KULP, D.D.S., in the fifty-ninth year of his age.

Dr. Kulp's death from blood-poisoning was the result of an accidental injury received at the new dental building at the State University of Iowa, at Iowa City, where he was professor of operative dentistry and dental therapeutics. He was born at Wadsworth, Ohio, September 19, 1836. He was of remotely German ancestry, though the family came to America over two hundred years ago. He was trained in the public schools, and finished his education under private tutelage. About the twentieth year of his age he began the study of medicine, and about three years afterward severe trouble with his teeth called his attention to dentistry, and he decided to adopt that specialty, and in 1859 he entered upon dental practice at Muscatine, Iowa, but subsequently removed to Davenport, where he was long a prominent and skillful practitioner.

In 1867 Dr. Kulp received the degree of D.D.S. from the Missouri Dental College, graduating with the first class of that institution. He took great interest in professional education, and was long a member of the American Dental Association, of the Iowa State Dental Society (of which he was one of the promoters), and was one of the vice-presidents of the World's Columbian Dental Congress at Chicago in 1893. His interest in dental legislation was unflagging, and he was largely instrumental in securing the passage of the law regulating the practice of dentistry in the State of Iowa.

Recognizing the unsatisfactory state of dental nomenclature, Dr. Kulp developed and adopted in his teaching a uniform and lucid nomenclature of the surfaces of the teeth, with a notation of cavities which was deemed very clear and easily understood. This system was presented before the World's Columbian Dental Congress, Dr. Kulp being a member of the Committee on Nomenclature.

Aside from matters pertaining to his profession, Dr. Kulp was closely connected with the movement in the northwest which resulted in the government making a large appropriation for the making of a deep harbor at the port of Galveston, Texas. He was also one of the board of directors and treasurer of the Pan-American Transportation Company, and secretary of the Western Land and Live Stock Company, owning nearly a hundred thousand acres of land and twenty thousand head of cattle.

Dr. Kulp was married in 1861 to Miss Mary A. Jones, who survives him with three daughters, two of whom are married, and a son, Dr. J. R. Kulp.

## DR. N. MALON BECKWITH.

Died, in New Rochelle, N. Y., Tuesday, November 6, 1894, of remittent fever, Dr. N. Malon Beckwith, in the forty-ninth year of his age.

Dr. Beckwith was born in Ashtabula, Ohio. He received his education at Hillside College, Michigan, graduating in 1862. Commencing the study of dentistry with Dr. Ambler, of Cleveland, Ohio, in 1863, he remained with him till 1867, when he went to New York and was associated with Dr. Waite until 1872, when he opened an office for himself and built up a large and successful practice, numbering among his patients some of the best families of the city.

He was for seventeen years a member of Company B, Seventh Regiment, also a member of the Seventh Regiment Veteran Association. From 1880 to 1886 he was president of the League of American Wheelmen, and one of the founders of the Citizens' Bicycle Club. He was also a member of the New York Athletic Club, New Rochelle Rowing Club, and the Larchmont Yacht Club.

Dr. Beckwith was married on December 31, 1890, to Miss Ada Tavenor, of New York, who with an infant daughter survives him.

While Dr. Beckwith never took any active part in the dental societies, he was possessed of professional abilities of a high order. He was a courteous, friendly, and generous man, held in high esteem by all who knew him. His loss will be deeply felt by a large circle of friends, as well as by his many patients. W. F. Davenport.

## DR. THOMAS K. BRYAN.

Died, at Corn, West Virginia, November 17, 1894, of phthisis, Thomas K. Bryan, D.D.S.

Dr. Bryan was born at Corn, Mason county, W. Va. He began the study of dentistry in 1891, in the Dental Department of Vanderbilt University. After passing a state examination, he commenced practice at Pikeville, Ky., in the spring of 1893. He subsequently entered the Atlanta Dental College, and graduated from that institution with the class of 1894. Though young to the profession, he exhibited qualities which, had he lived, would probably have led him to marked success.

## DR. W. A. MCQUAIG.

Died, at Lake City, Florida, November 12, 1894, of continued fever, Dr. W. A. McQuaig, in the thirty-fifth year of his age.

Dr. McQuaig was born at Glenmore, Georgia, May 1, 1859. His dental pupilage was spent with Dr. Brown, of Blackshear, Ga. He began practice in southern Georgia in 1882, but had been in practice for several years at Lake City, Fla., up to the time of his decease. He was a member of the Florida State Dental Association, and was elected president of that body in May, 1894

In 1883 Dr. McQuaig was married to Miss M. Bryant, of White Springs, Fla., and she and three children survive him. He was an intelligent, honorable man, and his comparatively early decease is much regretted.

## DR. FRANK W. WILLIAMS.

DIED, at Greenfield, Mass., December 18, 1894, of paralysis, FRANK W. WILLIAMS, D.D.S., in the thirty-ninth year of his age.

Dr. Williams was born at Petersham, Mass., February 16, 1856. He was educated in the public schools of Amherst, and passed a dental pupilage with Dr. J. J. Vincent, of that place, from 1873 to 1878. During the latter year he entered practice at Greenfield, and was very successful and popular. A few years later he matriculated at the Pennsylvania College of Dental Surgery, and graduated therefrom with the class of 1885. He was a member of the Connecticut Valley Dental Society, and its president for two years, and was also a member of the Massachusetts State Dental Society.

Dr. Williams was much admired for his sterling integrity and manly qualities, and, although he had not been strong for a year or more, the final event was a shock to a wide circle of relatives, friends, and acquaintances. He was a Knight Templar and Mason, and interested himself much in the circles of those orders. He was not married.

## DR. WILLIAM A. PAYZANT.

DIED, at Halifax, Nova Scotia, January 1, 1895, of accidental poisoning by carbolic acid, Dr. WILLIAM AUBREY PAYZANT, in the twenty-ninth year of his age.

Dr. Payzant was born at Cornwallis, Nova Scotia, October 26, 1866. He studied dentistry in the office of his father, Dr. E. N. Payzant, of Wolfville, from 1885 to 1888. He attended lectures at the Baltimore College of Dental Surgery, with the class of 1887–88, and in the latter year entered practice at Wolfville. He was a member of the Nova Scotia Dental Associattion.

Though young, Dr. Payzant had acquired the reputation of an expert and artistic dentist, with a quick, light touch and true hand. A specialty with him was crown- and bridge-work, in which he took a decided interest.

Dr. Payzant was a Mason, and the ceremonies of that order were performed at his interment at Wolfville, whose citizens exhibited marked appreciation of his worth and character, and sent loving tributes to his afflicted household.

# HINTS, QUERIES, AND COMMENTS.

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—I have just read in the COSMOS, in the report of the American Dental Association, an account of the absorption of tooth-structure by the pulp, and have two such cases to report.

*Case I.*—A woman about thirty-five, married, good health, right upper cuspid presenting a small cavity on the palatal wall, pulp exposed. After using arsenic, took out the pulp, and found the tooth to be but a shell of enamel, very little dentine being left from the cutting-edge to near the end of the root.

*Case II.*—A woman about forty-five, very stout, poor health, right upper second bicuspid, small cavity on palatal wall under the margin of the gum, pulp exposed, walls thin; cavity caused by enlargement of pulp-chamber to about size of No. 3 shot; pulp-canal in the root normal.

Both patients have shown this condition during the past three years.

VINCENT W. BAKER, Plainfield, N. J.

## CORRESPONDENCE.

To the Editor of the Dental Cosmos:

*Sir*,—Since my return from the meeting at Asbury Park, N. J., I have had two cases that verified your theory of the passage of zinc chlorid through the sides of the tooth from the pulp-canal, so I have given up the use of zinc chlorid after removing the pulp, and have gone back to carbolic acid. In these two cases the pain was intense. For one patient, a young lady, after she had passed three sleepless nights, I extracted the tooth. The other, a young man, worried along for three weeks, the pain gradually passing away.

Geo. A. Maxfield.

Holyoke, Mass., November 16, 1894.

Dr. Geo. A. Maxfield, Holyoke, Mass.:

*Dear Doctor*,—I received your favor of 16th inst., and was glad to have the item respecting your further experience with zinc chlorid.

I have some question, however, as to whether the subsequent irritation was due to the action of the medicament or to the immediate closure of the canal. Can you give me the grounds for your belief that the zinc chlorid was the source of irritation? Yours truly, Edward C. Kirk.

Dear Dr. Kirk:

In my letter of November 16, I referred to two cases where severe trouble ensued after I had removed the pulp—with aid of cocain—and filled the teeth, which, in my judgment, was caused by the injection into the canals of the saturated solution of zinc chlorid. I detail the circumstances.

Case No. 1. Miss S., operator in telephone office, nervous temperament; came in August 6 with pain in left inferior first molar. I found the pulp nearly exposed. I washed out the cavity and applied a pellet of cotton moistened with creasote, on which were sprinkled a few crystals of cocain. Pain was relieved, and an appointment made for August 8 at 10 A.M. At that time I had no trouble in benumbing the pulp and removing it. I filled the canals and the cavity, and dismissed her before 10.45. She returned next morning and said she had not slept any all night; the pain came on within two hours after she left the office. On examination, I found but little tenderness on percussion and no redness about the gums. I removed all fillings from cavity and canals, and placed a small pellet of cotton moistened with eucalyptol and iodoform in the pulp-chamber and loose cotton in the cavity, and applied tinct. aconiti, iodin, and chloroform to the gum. She came in again at 5 P.M. There had been no abatement of pain No more tenderness on percussion than in the morning, which was very slight. Applied capsicum plasters and prescribed quinine, two grains after each meal; also antikamnia, five-grain doses, taken one hour apart till three doses had been taken. She returned next morning with condition unchanged, and no abatement of pain. She had had another sleepless night. I continued the same treatment, and in addition drilled through one canal and injected cocain, which gave temporary relief for about fifteen minutes. I succeeded in encouraging her to patience for another night. She returned in the morning (Saturday), having passed another sleepless night and no abatement of pain, which continued the same,—a steady, constant pain. After another treatment to the gums and change of dressing in the tooth, I dismissed her with instructions to report at five o'clock. At that time she returned, and, as there was no abatement of pain, I could not send her away to another sleepless night, as her general physical condition was showing decided effects from the strain and sleeplessness. I then injected a four per cent. solution of cocain and painlessly extracted the tooth. There was no more pain. She retired at 6.30 and slept till 8.30 the next morning. I ought, the second night, to have prescribed a hypnotic.

Case No. 2. Mr. P., age 22, bilious-sanguine temperament; came in by appointment, Saturday, August 11, at 1.45 P.M.; large cavity in second inferior right molar. I found the pulp exposed,—"had ached on and off," as he expressed it. I removed the pulp with no trouble or pain, and filled cavity and canals. Dismissed him at 2.30. Returned Monday morning, complaining of a steady pain, which came on one hour after he went home. I removed the filling and treated as in Case No. 1. As this was the next Monday after Miss S.'s case, I concluded what was the trouble. Symptoms were the same, and hardly any tenderness on percussion. I continued treatment for two weeks, seeing him three times a week. At no time was he kept awake all night, though his rest was broken. At the end of the second week the pain began to grow less. He was then called home to Canada, and I did not see him again till November 5, when he reported that the pain entirely ceased about two weeks after he went home, and had not given him any trouble since. As the canals had remained open all the time he was away, I placed a dressing in the canals and gutta-percha filling in the cavity for one week, when I filled the canals, and waited another week before filling the cavity. The tooth has given no trouble since.

In these cases, if the trouble had come from the immediate closing of the canals, I would have found the tenderness on percussion to have increased. Pain also would have increased till an abscess formed, or it would have yielded to treatment. I have never had a case of this description where carbolic acid was used. I have had not over ten cases where there has been a little pericemental trouble, but these cases easily yielded to treatment. I believe, in the two cases cited above, that the tubules of the tooth were saturated with the zinc chlorid, which was transmitted through to the pericementum, there acting as an irritant. A query, Would packing the canals and pulp-chamber with an alkali have had any influence on the zinc-chlorid solution? It did not occur to me till after the trouble in these cases was over that this might have been tried.

I have thought these details were necessary that you might better judge whether in these two cases your theory was proven in practice. I firmly believe it is proven, and I shall not use the zinc solution again. I had used the zinc since last May, treating over thirty cases, and these two only gave trouble. As I have had no trouble in over one hundred cases where I have used carbolic acid, I have returned to it.

Yours sincerely, GEO. A. MAXFIELD.

HOLYOKE, MASS., January 14, 1895.

[The above correspondence is published because it throws light upon the question of the penetrating power of the coagulant medicament, zinc chlorid, from the clinical standpoint. So far as experiments made out of the mouth can determine the question, it would appear to be proven that practically the only limiting condition of the penetrating power of zinc chlorid with albuminous matter is the relative quantities of the two substances concerned. The assumption of Dr. Maxfield, that the irritation and pain following the use of a saturated zinc-chlorid solution in the canal was induced by penetration of the coagulant to the pericementum, seems to be warranted by the character of the symptoms produced. Had the pain and inflammation been the result of bacterial infection, there would have been swelling and pus-formation. Both of these features were absent. The inflammatory condition described was in all respects that which results from chemical irritation of an escharotic character. The writer has had several cases of pericemental irritation following the use of saturated zinc-chlorid solution in canals where the apices have been carefully closed with gutta-percha cones, moistened with chloro-percha or eucalyptol. Irritation of the pericementum has not followed the use of more dilute zinc-chlorid solutions,—say ten per cent. The suggestion of Dr. Maxfield, to neutralize the activity of the zinc chlorid by the use of an alkali, is in the right direction, and would probably have arrested its action. Treatment of the canal by a dressing of aqua ammonia fort. on cotton would have decomposed the zinc chlorid and rendered it inert. —EDWARD C. KIRK.]

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir,*—In the November issue of the DENTAL COSMOS, page 894, Dr. Harlan, of Chicago, is quoted as saying before the American Dental Association, in reply to Dr. Palmer's paper on the "Etiology of Dental Caries," as follows:

"I would ask Dr. Palmer how an essential oil can become oxidized in the root of a tooth, and how it is that, if gutta-percha is oxidizable, it is used for covering the Atlantic cables, which are laid in the water?"

Considering the importance of a root-filling being indestructible by exposure to moisture, I beg to quote from an article in "Chambers's Encyclopedia" on gutta-percha.

It reads: "It has been used for making a variety of articles, but its most important application has been the coating of marine electric-telegraph wires. In this application, as in most others, *its inherent defect*, arising from the readiness with which it becomes oxidized and decomposed, is unfortunately manifesting itself seriously, and a substitute having greater stability is anxiously looked for."

Farther on it says,—

"It is most probable that india-rubber will eventually displace gutta-percha in some of its most important applications, and especially in the coating of telegraph wires." C. FISCHER, Chemist.

917 CLINTON STREET, PHILADELPHIA, PA.

THE GREATEST GOOD TO THE GREATEST NUMBER.—Dr. John Smith, in the June (1894) number of the *Items of Interest*, in speaking of an article written by me, has mistaken my meaning. I will endeavor to make myself clearly understood. Dr. Smith says I have forgotten "that if a dentist is given a license by a newly created state board, it is on evidence that he is competent to practice his profession." I fail to understand how any honorable board could give a man a certificate "on the evidence that he is competent to practice his profession" when they know *nothing* about his ability, but simply know that he has complied with the law by being in practice at the time of the passage of the law. The certificates which I have seen given to men in practice at the time of the passage of an act simply state that he has complied with the law, and say not a word about his ability; on the other hand, those I have seen obtained *after* the passage of an act read, "Such as prove under examination in the theory and practice of dentistry qualified in the judgment of the said board." If this difference is not made in all certificates, it should be, as it is the only honorable way. Dr. Smith says, "Dr. Hodgkin further says, 'It is clear that a state license in itself is not evidence that a person is competent to practice dentistry,' meaning, of course, those who were in the state when the board was created." An illustration: I was once in a state where no dental law existed. A law was about to be enacted, and later was. Before it was enacted, however, there were attending college in the state a number of students, some of whom had only been in attendance two or three months. They opened offices and were in practice at the time of the passage of the act, and received certificates, not on the evidence that they were competent, but simply that they had complied with the law. Now, would it be right to ask a community to accept such a certificate as this as evidence of a man's ability? It is clear that the amendment of Dr. C. Stoddard Smith would govern the foregoing case. Would it be right to give such a certificate the same value before a state board as one which reads, "such as prove under examination in the theory and practice of dentistry qualified in the judgment of the said board"? Dr. Smith says, "There are dentists who have forgotten more about dentistry than some of us ever knew, who, if compelled to go before a state board and pass an examination, would be rejected." I admire the doctor's liberality, but I really do not think that they should be accepted on what they have forgotten; and would it not be just as easy for them to prepare themselves and pass an examination as it would be for any one else? It would not be a unit law if it did not put all on an equal footing.

Dr. Smith asks the question, "Are all holders of state certificates after examination competent? Experience answers no." This names the disease: let us have the remedy. The resolution formed by the National Association of Dental Examiners, at their meeting in Chicago, August 11, 1894, is the best that I have ever seen. It reads thus:

"*Resolved*, That it is the sense of the National Association of Dental Examiners that, when a member of the profession presents a certificate of registration from a state board of dental examiners duly created by law, that the same should entitle the holder of such certificate to registration without an additional examination in any state in the Union having a law to regulate the practice of dentistry."

Dr. C. Stoddard Smith's amendment to this is as follows:

"Provided such certificate was obtained on examination."

To my mind there is nothing which can be added to the resolution *with* Dr. Smith's amendment, and nothing which can be taken from it that will make it a more just and honorable law

When we get a law like this, then we will have a law that is worthy of the name, and a profession that will stand together.—F. C. HODGKIN, D.D.S.

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—I have a method of mounting the Logan crown which I think will be interesting to the readers of the COSMOS.

I prepare the root in the usual way, make a cap of gold to fit it, drilling a hole over the root-canal somewhat larger than the enlarged canal, place the cap in position on the root and grind the crown, which I have selected, to fit the cap perfectly; then remove the cap from the root, fasten the cap and crown together with a little wax cement in as nearly their correct relation to each other as possible. I then place them on the root while the wax is still soft, so that any necessary changes may be made, remove the two together and invest in plaster and sand, pack soft gold foil in the countersink around the pin until it is nearly flush with the cap, flow solder over this, and the crown is complete.

Great care must be taken in soldering. E. R. STEVENSON, D.D.S.

CORAOPOLIS, PA.

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—In the printed report of the discussion which followed the reading of my paper at the meeting of the New Jersey State Dental Society, I am quoted as stating that "I believed homœopathy contained great truth." You will see that this is evidently a stenographer's error, for it is a contradiction of the idea expressed in the essay. This is of trifling moment, but, even then, it should be corrected. What I did say, and the idea to be conveyed, was that I regarded "homœopathic dogma" as a typical fallacy, which I stated contained a *modicum* of truth; that it has been of great negative service. It did not or does not actively demonstrate error, but through it error has been demonstrated. I am strongly of the opinion, or, I may say, firmly convinced that the definition of homœopathy given in the paper is correct,—that homœopathy, with what are usually known as phrenology, chiromancy, and so on, are all to be included in a list which may be titled irrational induction and faulty ratiocination, to distinguish them from science proper, which admits only accuracy of reason, based upon the rules of logic.

Very truly, HENRY BURCHARD.

REPAIR OF BRIDGE-WORK.—A simple method of restoring the porcelain facing broken away from a piece of bridge-work is as follows: We take, for illustration, a central incisor. Make a perpendicular slot in the backing, of a width slightly exceeding the distance between the outer edges of the pins in the selected tooth. The depth must be proportioned to the thickness of the gold at this point, care being taken not to endanger the strength of the piece. Undercut on both sides. Fit accurately to this slot a beveled slide of hard 18-carat gold backing. It should be exactly flush, no more. After grinding the tooth to gum, adjust to the backing and try in. When all is satisfactory, solder. The holes for the pins should be widely reamed (not enlarged), and but little solder used. File away surplus, and you will have a tooth which will slide exactly into position, leaving the lingual surface of the piece unaltered. A little thin phosphate will secure it. It will be more solid than a Tammany boss.—CHARLES W. JENKINS, D.D.S., Zürich, Switzerland.

MANIPULATION OF CRYSTAL GOLD.—In the November (1894) COSMOS, Dr. Gillett calls attention to the fact that imperfect fillings can be made with the new crystal golds. I have had considerable experience with an old and reliable crystal gold,—viz, Watts's,—and I should say, from having used it once or twice, that the new crystal mat gold is a somewhat similar preparation, and requires the same manipulation. In packing Watts's crystal gold, a plugger with large condensing surface should *never* be used, except, perhaps, for condensing the surface of the filling into smoothness before applying files, emery-paper, disks, etc. The instruments sold as retaining-point pluggers are just right for working this gold. Use a mallet wherever direct force can be applied, and condense the gold carefully and *thoroughly*. Use hand-pressure where direct mallet force cannot be used. An indirect or sliding blow is inadmissible with this gold. The points may be either finely serrated or smooth, and the condensing surface flat. Personally, I prefer the serrated point for hand-pressure, and the smooth for mallet-force. If your points are not used, and great care is not taken, the adaptation will be imperfect, and on masticating surfaces the gold will chip or flake off at the edges. If foil is used, pluggers with larger condensing surfaces may be employed with advantage, and equally good results obtained in less time. I have therefore given up the use of crystal gold, and do not expect to go back to it.—W. C. G.

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—I desire to call attention to the fact that bisulfid of carbon will change the brown color, so often seen in the so-called black rubber plates, to a jet black. It is a transparent, coloress fluid, which has a penetrating and very disagreeable odor, a taste which is acrid and somewhat aromatic, so that it will be found necessary, after allowing the plate to stand for a few moments in the bisulfid, to put it in water to remove the nauseating effects and odor. —J. LEVIN CHAIM, New York College of Dentistry.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.

**Choquet** (J.) Traité technique des préparations microscopiques à l'usage du dentiste. Paris, 1895, 138 pp., 1 l. 16°.

**Dental** Hospital of London. Donations needed towards the new buildings in Leicester Square. £40,000 required. [Amounts received or promised.] London, 1894, Harrison & Son, 1 l., fol.

**Hamonaide** (G.) Examens des chirurgiens-dentistes; anatomie, physiologie, pathologie et thérapeutique dentaires programmes, épreuves pratiques et questionnaires, comprenant toutes les questions posées aux trois examens des chirurgiens-dentistes et recueillies. Paris, 1894, Baillière et fils, 85 pp. 18°.

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# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING NOVEMBER AND DECEMBER, 1894.

*November 13.*—No. 529,010, to John W. Anderson. Dental articulator.
" *27.*—No. 529,902, to Aaron P. Gould. Dental or surgical chair.
*December 4.*—No. 530,153, to Samuel Zucker. Tooth-brush.
" " No. 530,159, to Frank E. Case. Surgical chair.
" " No. 530,187, to Philip B. Laskey. Syringe.
" " No. 530,344, to Joseph A. and Benjamin A. Jeffery. Electric dental engine.
" " No. 23,852, to Wm. G. Hullharst. Design for dental cabinet.
" *11.*—No. 530,524, to David M. Hitch. Dental articulator.
" " No. 530,556, to Fred D. Sherwin. Dental saliva-ejector.
" *18.*—No. 531,092, to Minor P. Boyd. Process of forming dental plates.
" " No. 531,093, to Geo. A. Bronson. Dental napkin-holder.
" " No. 531,094, to Geo. A. Bronson. Dental napkin-holder.
" " No. 531,257, to Adam Bond. Dental bracket.

THE

# DENTAL COSMOS.

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## ORIGINAL COMMUNICATIONS.

### COAGULANTS AND NON-COAGULANTS.

BY A. W. HARLAN, M.D., D.D.S., CHICAGO, ILL.

(Read before a union meeting of the First and Second District Dental Societies of the State of New York, January 8, 1895.)

It has been my good fortune on several occasions in past years to be the guest of the First District Dental Society of New York, but never before have I been doubly honored by two societies uniting for an evening to listen to one of my productions.

I have, as occasion offered, presented my views and experiments on the uses of various non-coagulators, and coagulators of albumin, in the reports of the American Dental Association, the Illinois State Dental Society, the Iowa State Dental Society, before numerous local dental societies in and around Chicago and New York, before the Odontological Society of Great Britain, the Dental Congress at Paris in 1889, and in several dental periodicals of repute in this and other countries, as well as before classes in dental colleges. After all these labors of a dozen years or more, the world is informed that all such statements and experiments are mere "assumptions," not being based on observed or recorded facts. In truth, the reviewer of my work was not able to find anything but an "assumption" as a basis for a quotation like this: "Coagulators of albumin must be kept out of pulpless teeth. . . . No necessity exists for their use in pulpless teeth. Coagulation always prevents diffusion of vapors and vaporizable substances." Or this: "A coagulum is, however, an effectual barrier to the immediate penetration of medicaments in roots of teeth for the purpose of disinfection, and should not be produced." The author of the paper and also the theory of "assumptions" not only failed to establish this point, but, with the valued assistance of another, failed in his attempted bibliography, and then duly thanked the latter for his unrecognized errors!

In addition to this, he reports some very inconclusive experiments, more or less irrelevant, which are not "assumptions." They bear the earmarks of pure science. "Assumption" has no place here. The foregoing experiments (see DENTAL COSMOS, March, 1894, pages 181 to 191) led the author, Dr. E. C. Kirk, to the following conclusion: "I infer that coagulating antiseptics are not self-limiting barriers to the diffusion of antiseptics *other* than themselves, *when the conditions necessary to osmosis are fulfilled.*" [Italics mine.] Then the author of the above-mentioned experiments, Dr. Kirk, lets himself down very easy by begging the whole question, as follows: "The subject is a very broad one, and difficult to treat even superficially [which was not so difficult before his experiments were made] within the limits of a paper of this character. There is a large field for investigation as to the questions whether coagulation invariably means sterilization, the extent to which antisepsis and disinfection are produced by coagulants, and how their therapeutic action is modified by the presence or absence of albumin, and especially as to the quantitative relationships of these agents to the amount of infected and decomposing tissue involved. All of these matters are, however, aside from the immediate problem which I have endeavored to set before you,—viz, 'Do coagulants prevent diffusion of antiseptics in the treatment of pulpless teeth?'" To which I answer, They do.

The *piece de resistance* of this paper is the closing exordium, which is meant evidently by its author to hit some one. It is simply crushing. I will read it:

"Our system of education is principally a process of mental stuffing. The habit of examining and criticising evidence is nowhere taught except in our law schools, and there only very imperfectly. To accept as true all that established authority says is true, and to store up such statements in the mind by an effort of memory, is the kind of training which principally prevails. And if it be granted that most of the utterances of accepted authorities are true, the power to criticise evidence, to determine that which is true or false, and to arrive at just conclusions, is still of far higher value than the mere memorizing of facts. But the fault is not alone confined to the cultivation of a habit of accepting statements of truth solely upon authority. It is equally true that things are taught in our schools of which, to say the least, their truth is yet an open question, and upon these doubtful questions it is insisted, more strongly than upon any others, that they should be blindly accepted upon authority."

What bearing such an old saw as this has on the question at issue I leave for your consideration.

The discussion following this remarkable paper (printed in full in the April Dental Cosmos, 1894) was marked by generous appreciation, but not unquestioned acquiescence. A saving clause for the principal actor of this evening crops out here and there, showing that even a little good may spring from the western horizon. The author, in closing the discussion, says, "We have seen . . . the power of these agents to diffuse entirely through the structure of a root." "It is perfectly possible, on theoretical grounds, to my mind, to fill a root with zinc chlorid [this implies that the apex of the tooth is sealed hermetically before the introduction of the zinc chlorid] and leave such a dressing in a root long enough to produce chemical irritation of the pericementum by osmosis. I think it is possible to do the same thing with arsenic, in our treatment with arsenious acid or with any other such substance. We want to bear in mind that these materials which we have considered as self-limiting are not so."

Arsenic is not a true coagulator of albumin, hence it need not be here considered. Indeed, there is so much more of value to be considered that I beg your patience for answer to the paper.

As long ago as 1880 my attention was called to the indiscriminate use of the prominent coagulators of albumin—viz, chlorid of zinc, carbolic acid, and wood creasote, and incidentally to aromatic sulfuric acid. I had found, by clinical experience, that many pulpless teeth after being dressed and soaked for days and weeks with the above-mentioned agents, and the roots afterward filled more or less completely, gave their possessors much trouble. In some cases, where small portions of the pulp had been allowed to remain under root-fillings, either a blind or fistulous abscess was developed. I came to the conclusion that this might have been brought about through the superficial coagulation of non-vital portions of such pulps and the direct coagulation of the exposed inner surface of the animal matrix and contents of the dentine tubes of the tooth. (Infective matter, ptomaines, and cadaveric alkaloids by such superficial coagulation were sealed in the dentine, and afterward the cementum and pericementum were affected by the presence of such *materies morbi*, so as to produce intermittent spasms of irritation, which later produced protrusion of the tooth from its socket, rendering it useless for mastication.) When it is remembered that the glue-yielding portion of the tooth is impregnated with water to the extent of about ten per cent. of the bulk of a whole tooth, and that something like thirty per cent. is organic matter beside, I naturally concluded that there was something radically wrong in the then methods of pulp-canal treatment and sterilization by the use of coagulants. I had, as early as 1874, tried a series of experiments in staining dentine and cementum with various coloring matters,—carmine, silver nitrate and others,—by first sealing the apical end of a root with wax and paraffin, then placing a drop of alcohol—a coagulant—in the pulp-chamber and canal, and immuring the root in the staining fluid. I found, then, in these experiments, that I was unable to observe the coloring matter pass through the peridental membrane, cementum, and dentine, so as to contaminate the alcohol in the central chamber of the tooth. By reversing those procedures, placing the staining liquid in the pulp-canal and the alcohol on the outside of the tooth, I could not succeed in making the liquids intermingle. Subsequent cuttings for microscopical use failed, in all cases, to show that the alcohol had ever passed beyond the superficial portion which it coagulated. In these experiments I used freshly extracted teeth, and carefully sealed the entrance to the pulp-chamber so that the alcohol would not evaporate. Alcohol is a coagulator of albumin, pure and simple, and when it is largely in excess the coagulum is redissolved as a rule. This, however, is not the case with serum-albumin, in experiments out of the mouth or in the mouth. Example: If a half-drop of freshly extracted blood-serum is introduced into a pulpless tooth in the mouth with the apical end sealed hermetically, and absolute alcohol is applied to it to coagulate it, and afterward a mat of porous paper soaked in alcohol is placed over the coagulum, and the cavity is sealed with melted paraffin and the whole allowed to remain for a few hours, the coagulum will not be found dissolved. (It is not very easy to perform experiments of this nature.) Even after twenty-four hours the coagulum remains the same in appearance. Contamination from the fluids of the mouth can be prevented by the adjustment of the rubber-dam over the single tooth and gluing it with carbon bisulfid, or by slipping a rubber cap over the dried tooth, moistening the surface with carbon bisulfid and tying it securely with waxed silk. Coagulation with alcohol does not produce a chemical change. From the period mentioned until 1881 I was not able to use other than so-called coagulating agents, simply following the usual routine. About 1874 or 1875 carvacrol and thymol came into use in dental practice, but neither of these agents were largely used. Carvacrol is a very slight coagulator of albumin, but it will be diffused through the moist dentine in from ten to fourteen hours. Thymol is not a coagulator of albumin; it will diffuse through moist dentine in from three to six hours at 98.4° F.

I was not able to discover satisfactory agents as disinfectants until the year 1881, when my first paper on essential oils and $H_2O_2$ was published in the *Dental Register* for December of that year. Since that period I have published numerous papers on the same subject, all of which will be found in the Transactions of the Illinois State Dental Society, American Dental Association, the *Dental Review*, the DENTAL COSMOS, *Independent Practitioner*, Transactions of the Odontological Society of Great Britain, 1888, Transactions of the Iowa State Dental Society, *Southern Dental Journal*, Catching's Compendium, and elsewhere.

Last year the paper read before this union meeting by the editor of the DENTAL COSMOS, Dr. Kirk, averred that all my previous papers were based on an assumption, and that I was the originator or chief exponent of the assumption. Let us examine some of his work to verify or disprove such characterization.

The question of the penetrability or diffusibility of coagulators of albuminous matter, such as is present in the dentinal tubules and the animal matrix of a tooth, or which is found in blood-serum, seems even at the present time to have provoked a ripple of excitement in the minds of the members of this joint meeting, presented nearly a year ago by Dr. E. C. Kirk. The author of the paper, "On Coagulants in the Treatment of Pulp-Chambers and Canals," departed from his title and limited his observations, first to: "Do coagulant antiseptics produce with albuminous matter a coagulum which is a barrier to the further diffusion of the coagulant or other medicaments?" And second: "Or, as has been asserted, are coagulants self-limiting?" And third: "Do coagulants prevent diffusion of antiseptics in the treatment of pulpless teeth?"

From a reading of the title of the paper one would conclude that the whole subject was to have been handled exhaustively. Such, however, was not the case. It was simply a theoretical question in physics. The author of the paper endeavors to prove that coagulating agents in pulpless teeth are not self-limiting. He goes so far as to say from some experiments (inconclusive) that coagulators of albumin are diffusible. As Dunglison is accepted as authority on definitions, we will see what he says on diffuse: "Diffuse, to spread over a surface or through a mass either by the production of greater tenuity in matter, or by dissemination with force, as with electricity." "Diffusible, *diffundo*, to pour, to pour apart or abroad." "Diffusion liquid, intermixing of fluids or solutions with each other directly." Three agents, commonly known as coagulators, were used in the author's experiments,—zinc chlorid, carbolic acid, and corrosive sublimate. There is no report on the action of carbolic acid as a diffusible agent, hence we must conclude that the author was not satisfied with *its* diffusibility through dentine or in egg-albumen. (As a matter of fact, if a five per cent. solution of carbolic acid is poured gently into a tube containing egg-albumen, and the tube is stopped with absorbent cotton to exclude the air and moisture, it will be found that only a superficial film of carbolate of albumin is to be found on the surface of the egg-albumen. This is explained in this manner: As long as the carbolic acid in solution exerts its affinity for water we will have a carbolate formed; when this ceases, its action is ended. There is no diffusion beyond the concreted, filmal surface in contact with the deeper portion of the albumen. Melted carbolic acid when brought in contact with egg-albumen only exerts a more powerful action in consequence of its greater avidity for water, and in no case is it diffused over or through or across the bulk of egg-albumen with which it is brought in contact.) The report on zinc chlorid is likewise inconclusive, as no test was made to show that it could be recovered from the so-called coagulum around the root of the tooth through which it was assumed to pass. The report on sublimate, which demonstrated its passage through the tooth-root into the iodid solution, is the only conclusive experiment reported. *It* was demonstrated after three days. As corrosive sublimate is not a coagulator of serum-albumin, but simply a precipitant, it need not at this time further engage our attention. Globulin, which is found in the animal tissue in abundance, is a coagulable material; unlike serum-albumin, it is not precipitated by $HgCl_2$. The principal value to a dental society in a discussion of this character lies in the utility of the subject-matter discussed. You are not particularly interested in a subject if it does not produce results which will be conclusive. A special pleading such as was indulged in by the author (see DENTAL COSMOS, March, 1894, page 181), not being written or presented in a spirit to instruct, fails in its ultimate object, unless something can be deduced that will give us a rational basis for practice.

The history of osmosis is discussed in a grave and reverential manner to produce the impression that its discussion will, in some remote manner, fix on the mind of the auditor that the processes of diffusion and coagulation are analogous to it.* We are not to be blinded by such sophistry. The conditions surrounding a root of a tooth implanted in its socket are so dissimilar that there can be no comparison between the action of a coagulator of albumin in such a situation and the one where a tooth is suspended in egg-albumen. In the former case, the root is covered with a membrane (peridental). There is a definite quantity of moisture and animal heat. In the latter we have no record of temperature, but we have a positive record of the imbibition by the tooth of boroglycerid to saturation (in which menstruum, zinc chlorid, carbolic acid, and corrosive sublimate all are soluble). The inhibition of diffusion under such circumstances is practically *nil* when a tooth so treated is suspended in egg-albumen placed in a test-tube. It will be found that so long as zinc chlorid will find water to further dilute it, so long will we find coagulation, and no longer. Is this diffusion according to the best definition we now have? The above is true of carbolic acid, but we find that very soon the coagulation ceases; as the affinity which zinc chlorid has for water is so much greater than that of carbolic acid, the action is not so pronounced.

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* I quote a letter from Dr. Black on this point: "I have just completed a somewhat careful reading of Dr. Kirk's paper in the March number of the COSMOS. I should not be inclined to deny the possibility of osmotic action through coagula under the conditions assumed in his paper. We do not, however, obtain such condition in the treatment of pulpless teeth. Indeed, in most of Dr. Kirk's experiments pressure has been added to aid osmosis, and even then the action has been too slow, as it seems to me, to be available for therapeutic purposes, for, in the natural teeth as they stand in their alveoli we have constantly the action of blood-serum on the side of the peridental membrane counteracting and carrying away any slight amount of the antiseptic passing through. We should not, in our experiments, forget the facts that, first, it is immediate effects that we want; second, that the motions of the natural fluids are constantly neutralizing and nullifying the mo-

The coagulation produced by the author of the paper is nothing more, nothing less, than the satisfaction of the affinities of such drugs for water, there being no true diffusion of the drugs in either of his experiments. Zinc chlorid, liquefied, which is a powerful irritant and destroyer of tissue, is classed as a coagulator of albumin, when, as a matter of fact, it is an escharotic and charrer of animal tissue. Dilute solutions of zinc chlorid are coagulators of albumin, egg-albumen, but such solutions do not diffuse through it. This may be proven in many ways. It does not enter the circulation when applied locally in solution or undiluted. It does not spread and permeate the soft tissues; but, on the contrary, it passes in a straight direction from the surface to which it is applied until a sufficient coagulum is produced to prevent its further entrance into the soft tissues. It does not diffuse any farther or it would be found in the circulation. It does not mummify when used in full strength. The so-called hyaline coagulum (Atkinson) is nothing more than an atrophied pulp protected from destruction by anaërobic microbes, by an abnormal growth of the peridental membrane over the apex of the root. When zinc chlorid comes in contact with serum-albumin, it is destroyed, disintegrated, rendered unfit for food, save for pathogenic micro-organisms (Sternberg). Its action is always local; it does not permeate deeply. If you plant a freshly extracted tooth in plaster of Paris, having sealed the apical end, leaving the pulp *in situ*, and apply liquefied zinc chlorid, or fifty per cent. zinc chlorid, or twenty per cent., first, you cannot detect it in the plaster of Paris; second, it is not to be found in the cementum or peridental membrane; third, the coagulation of the animal matrix of the tooth leading from the pulp-canal is most superficial. The contents of the tubes do not

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tions and actions of our antiseptics. An antiseptic that will act in twelve hours in a test-tube will not act at all in the animal body. Indeed, the coagula that have limited the action of carbolic acid prove clinically to become the most favorable nucleus for the action of pus-microbes within forty-eight hours. This is shown particularly well in the practice of 'shooting piles' with carbolic acid. Every observer will, I think, testify to the severe suppuration resulting."

show under the microscope the characteristic hardening that we find in the use of other agents when the whole tooth is prepared by processes not analogous to Weil's method. (Teeth containing fresh pulps were treated with zinc chlorid for four months, and even then it was impossible to discover that the slightest trace of zinc had passed through the sides of the root or even the apex, when the only barrier was the naturally fitted pulp, the body of which was considerably shriveled but not wholly hardened after such prolonged exposure.)

It is hardly necessary to say much of corrosive sublimate in this connection, but I will say this: When poisoning takes place with $HgCl_2$, the antidote is egg-albumen. If it is a diffusible agent through tooth-structures, why does it not diffuse through the walls of the tooth and produce toxic symptoms? When it is brought in contact with a Herbst pulp-stump, why is it not diffused through the remainder, producing the train of symptoms that mercury is known to produce? As soon as the albuminate of mercury is produced in the stomach, the patient is free from further danger. The reason why large doses of sublimate seldom produce death is that the comparative insolubility of $HgCl_2$ in water, sixteen to one, produces, first, filmal precipitation of albumin, and, second, nausea, which expels the whole mass from the stomach. The administration of white of egg produces the insoluble albuminate of mercury, which is inert, and the patient lives. If, after the albuminate is formed, diffusion took place, manifestly egg-albumen would not be a safe antidote for poisoning by corrosive sublimate. But it is. Workers in bacteriology found that corrosive sublimate was not a good disinfectant, because it precipitated albumin and prevented its further penetration of soft tissues; hence the addition of hydrochloric acid or tartaric acid to prevent such precipitation. If you take an elbow test-tube and fill it nearly full of beef broth (sterilized), and add a saturated solution of corrosive sublimate to one end and protect the other with cotton wool, the sublimate will not prevent a growth of organisms under the cotton wool, but at the other end no growth takes place. If it is diffusible through albumin, why does it not diffuse through the broth and keep the whole contents sterile?

The writer deems it a necessity to present this paper to refute the erroneous impressions left last year by the reading of the paper, "On Coagulants in the Treatment of the Pulp-Chamber and Canals"; he feels that its teachings were so opposed to the facts of pure science that it was a public duty. He also regrets that it was impossible to cover the whole subject of coagulants and non-coagulants, with a practical lesson; but reference to previous papers, elsewhere referred to, must suffice to stimulate the earnest searcher after truth to a re-perusal of them to refresh his memory on this intensely practical subject.

To recapitulate the essence of this paper, I have prepared the following conclusions:

First. True coagulators of serum-albumin are not diffusible when brought in contact with it in a tooth-root.

Second. Coagulators of the organic matrix of a tooth-root, tube contents (dentine), by the concretions of such albuminous matter prevent the further entrance of such coagulators as soon as their affinity for water is satisfied.

Third. The destruction of a coagulum in such situations being a foregone conclusion through the agency of anaërobic microbes, brings about a chemical change in a coagulant antiseptic which deprives it of the coagulant property ; hence it passes into the circulation, and is excreted as other foreign inert bodies are discharged from different channels.

Fourth. The addition of boroglycerid to a coagulant in definite proportions so alters it that it no longer acts as a coagulant ; hence it is possible for it to pass through tooth-structure and be recovered from the liquid media surrounding a tooth, when its coagulating property will be restored.

Fifth. Non-coagulants soluble in water diffuse readily through tooth-structure, as has been shown repeatedly in experiments out of the mouth, not only in egg-albumen, but likewise in serum-albumin.

Sixth. Oleaginous non-coagulants pass through the structure of a tooth quite slowly in the presence of water in serum-albumin, and oils pass through filtering solutions, showing that they displace water. The vaporizable portion of an essential oil will give to a substance which it permeates the characteristic odor in from three to six hours (Watts).

Seventh. A non-coagulant disinfectant destroys developed, and deprives the spores of anaërobic pathogenic microbes of the power to be developed ; and, as it does not coagulate albumin, it does not prepare a food for the sustenance of any accidental ingress of such developed organisms ; hence the future of such teeth treated by non-coagulants is infinitely preferable to the conditions surrounding those treated by coagulants.

Eighth. A non-coagulant disinfectant completely sterilizes infected dentine by virtue of its diffusibility through it, while a coagulant either precipitates an insoluble barrier or so concretes the albuminous matter with which it comes in contact that it cannot act as a perfect sterilizer, but effectually seals infectious and poisonous matters in the dentine, which ultimately have their exit through the cementum and pericementum, depriving both structures of needed vitality.

## CONTRIBUTION TO THE STUDY OF CONSOLIDATION OF IMPLANTED TEETH.

BY DR. OSCAR AMOEDO,

PROFESSOR OF THE ECOLE ODONTOTECHNIQUE OF FRANCE.

In a communication made to the International Congress of Rome on the "Implantation of Decalcified Teeth," I alluded to a maxilla that I had found in the laboratory of my teacher and friend, Professor Poirier.

This maxilla, Fig. 1, which belonged to a man of forty, presented the peculiarity of having on the left side a second milk molar ankylosed between the first permanent molar and the first bicuspid.

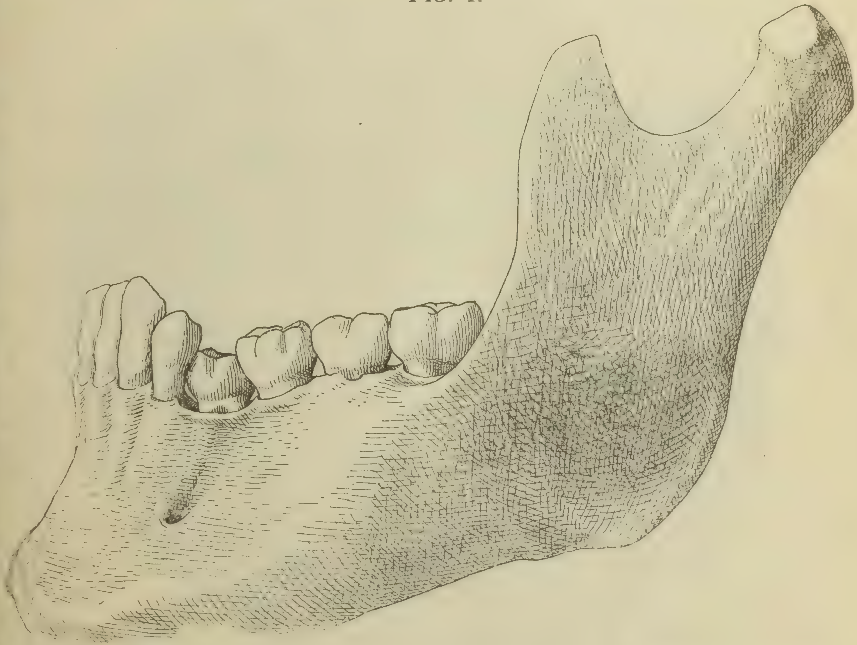
Hoping to find the second bicuspid in the interior of the bone, I cut the maxilla in two, with a saw passed at the level of the milk tooth.

My researches in this direction were fruitless ; there was not the slightest trace of the second bicuspid; but when I directed my attention to the site of the temporary tooth, I was greatly surprised to discover the cause of certain phenomena much discussed even to-day.

The following is what I have ascertained microscopically: All over the surface of the root the pericementum had disappeared, the cementum was destroyed in a large part, and was substituted by an osseous proliferation coming from the alveolar wall; the pulp-chamber was filled with secondary dentine.

All the force and movements of mastication or percussion impressed upon this crown were conveyed through the roots, and were transmitted to the bone without any interruption. Percussion produced a very clear sound, entirely different from that produced on the neighboring teeth.

FIG. 1.



Inferior maxilla of a man forty years old, with a temporary molar caught between the first permanent molar and the first bicuspid. Left side.

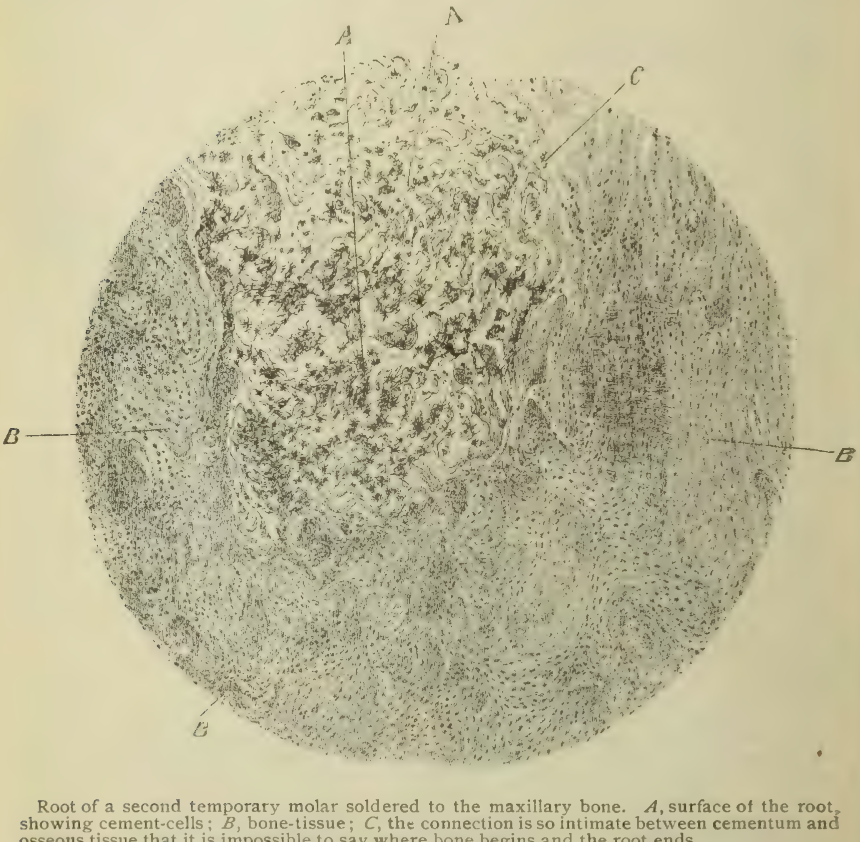
These phenomena led me to believe in a secondary intimate soldering between the root and the maxilla. I presented this piece to the congress at Rome after I had shown it to several of my colleagues, and to my friend Dr. Younger, during his last trip to Paris in November, 1893. They admired it very much, and asked me to make some microscopic sections of it and publish my observations; but my desire to keep for my own museum such a rare pathological case made me abandon this idea.

Finally, after some references to this matter in the *Journal of the British Dental Association*, and further at the request of the editor of the DENTAL COSMOS, I decided to destroy the specimen in making the sections with which I have illustrated this work.

These sections have been made by grinding, without decalcification or staining, and have been fixed to the slides with Canada balsam.

Figure 2 represents a transverse cut of the bone and a longitudinal one of the root. It shows very clearly the osseous cells and the Haversian canals on one side, and the corpuscles of the cementum on the other. Between these two tissues there is no line of separation, specially at C, it is not discernible where the osseous cells begin and where those of the cementum end.

FIG. 2.



Root of a second temporary molar soldered to the maxillary bone. *A*, surface of the root, showing cement-cells; *B*, bone-tissue; *C*, the connection is so intimate between cementum and osseous tissue that it is impossible to say where bone begins and the root ends.

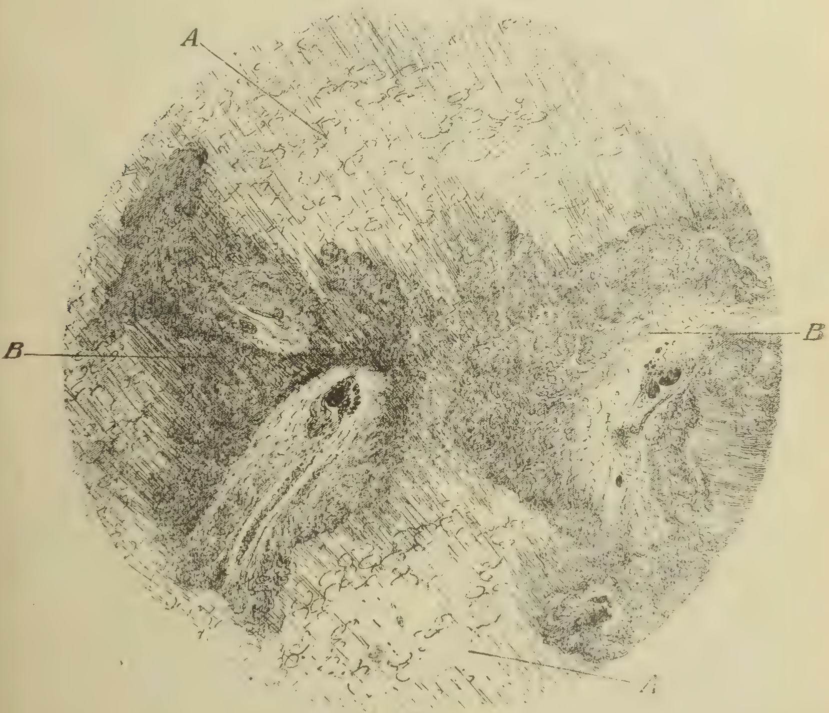
To explain this pathological process, we must believe that at the time that this milk tooth should have disappeared to make room for the second bicuspid it was not shed, and thus became an obstacle to the normal development of the second bicuspid, that remained imprisoned in the thickness of the maxilla. The second bicuspid was unable to break through the wall that was in the way of its passage, and consequently the tooth played the part of a foreign body irritating the bone; which irritation produced an over-excitement of the activity in that region, and ended in the resorption of the tooth in evolution and of a great part of the roots of the milk tooth.

The cause of the irritation having disappeared, a very compact bone, rich in osseous corpuscles, filled the hollow left by the second bicuspid, and the bays upon the surfaces of the roots.

On the other hand, the milk tooth also similarly reacted, and the pulp-cavity became filled with a deposit of secondary dentine.

There is a perfect analogy between what happened to the roots of this tooth and the bone, and what occurs between the bone and the roots of implanted teeth.

FIG. 3.



Secondary dentine of the second temporary molar. *A*, primary dentine ; *B*, secondary dentine.

Here it is what I have ascertained in the implantations that I have made in men, and in my experiments on dogs and guinea-pigs. These operations, let me say, have always been made under conditions of a rigid antisepsis.

The implanted tooth acting as a foreign body irritates the bone, and produces an osteitis with formation of lymph-cells, which are arranged in line, and form an embryonal membrane throughout the periphery of the alveolus. These embryonal cells advance toward the root until they cover it. The decalcification and the erosion of the root begin, and afterward can be seen how the giant cells, with acid reaction (lactic acid), and the osteoclasts, form little bays on the surface of the root. If, then, the tooth is sufficiently firm, and the general condition of the patient is good, the root does not act any longer as a foreign body, and the resorption stops.

The embryonal tissue formed between the tooth and the alveolus is soon vascularized, and the osteoblasts appear. By degrees, calcific deposits are also formed and the progress of the osseous transformation can be followed, until finally the root and alveolar wall are, as it were, soldered together.*

As a proof of the first stage of this process, on the surface of a root that has been implanted for a certain time in a maxilla, semicircular resorptions will be found in the form of bays, more or less defined. The same appearances will be found upon the roots of implanted fresh teeth as well as in those implanted after desiccation.

There are cases where the resorption is so superficial that the macroscopical examination of the root is not sufficient, and to see them it is necessary to have recourse to the microscope.

The second stage of this process of consolidation can be easily corroborated by the following signs:

1. The tympanical sound produced on percussion of a consolidated implanted tooth is always clearer and more resonant than that of the neighboring teeth.
2. All the movements communicated to the tooth are instantly transmitted to the bone without loss.
3. The marked resistance they offer to extraction.

## CANCER OF THE TONGUE.

BY DR. E. W. STEVENS, PHILADELPHIA, PA.

(Read before the Academy of Stomatology, January 8, 1895.)

FROM its structure and surroundings the tongue is peculiarly liable to be the seat of cancer. The disease is always of the squamous-celled epithelial type, scirrhus being rarely, if ever, found in this organ. Sarcoma of the tongue is rarely seen, but six cases being recorded in surgical literature.

Epithelial cancer is more frequently met with in the tongue than in any other organ or part of the body excepting the uterus. In 860 cases of epithelioma collected from the Brompton Cancer Hospital case book by Mr. Jessett ("Cancer of the Mouth," etc., London, 1892), the tongue was the seat of the disease in 190 cases, or at the rate of 22 per cent.; the uterus was affected in 222 cases, or at the rate of 25.8 per cent.; while the lips were affected in 160 cases, or at the rate of 18.6 per cent. The tongue also stands very high in the scale as compared with other organs affected by any form of cancer. At the Brompton Cancer Hospital, out of a total of 2227 cases of cancer occurring in patients during the ten years from 1882 to 1892, the tongue was the seat of the disease in 190 cases, or at the rate of 8.5 per cent. In 501 cases of carcinoma collected at the Middlesex Hospital by Mr. Henry Morris, the tongue was the seat of the disease in 7.1 per cent. of cases. In Mr. Arthur Barker's 343 cases at the University College Hospital, he found as high as 16.3 per cent. of cases of cancer of the tongue; while Sir James Paget, in 500 cases, found 6 per cent. Von Winiwater, in an analysis of 520 cases of cancer, found the tongue affected in 8.3 per cent. Dr. Sibley, on the other hand, in 520 cases, showed the tongue to be the seat of the disease in only 2.6 per cent. of cases.

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* In view of favoring the first stage of consolidation of implanted teeth, I decalcify always a section of the cementum half of a millimeter thick; and to favor the second stage (ossification around the root) I immobilize the tooth by ligatures of platinum wires and by a special apparatus (see DENTAL COSMOS, September, 1894).

Lingual cancer is extremely infrequent before thirty years of age. A case has been recorded as early as the twenty-second year by Dr. Shephard, of Montreal ("Reference Handbook Medical Sci."). In 58 cases collected by Mr. Whitehead, the oldest was seventy-six and the youngest thirty years of age. In the total of 133 cases collected by Dr. Gross, he found 82 were above fifty years and 51 under that age. The oldest was seventy-eight years of age and the youngest twenty-nine. In 190 cases analyzed at the Cancer Hospital by Mr. Jessett, the oldest patient was seventy-nine and the youngest thirty-two, the average age of the whole number being fifty-two years. The great majority of cases occur between the ages of forty-five and sixty years.

Epithelial cancer of the tongue is much more frequent in men than in women. In a total of 485 cases collected from the tables of Wolfler, Rose, Paget, Barker, Clarke, Morris, Von Winiwater, and Jessett, 414 were males and 71 females.

Heredity does not appear to be an important factor in the production of this disease. In Mr. Whitehead's 104 cases, there was a history of cancer in the family in only six cases. Herr Von Winiwater states that inheritance is excluded in almost all his cases; while in those collected by Mr. Arthur Barker and Mr. Henry Morris, family taint was positive in but four cases. According to Mr. Barker, "It would appear as though the occurrence of cancer in the families of those who have the disease in the tongue was little more than a coincidence."

The question of the liability of smokers to cancer of the tongue is one to which a great deal of attention has been directed of late years. The disease is not more common among males who smoke than among those who do not smoke, while women who are addicted to the habit do not have cancer; and yet, as Mr. Batlin observes, it is not improbable that smoking does to some extent predispose to the disease. If smoking—and the same is true of spirit-drinking—causes sores or leukoma of the tongue, or chronic superficial glossitis, it predisposes the individual tongue, in which these conditions are produced, to carcinoma; but if smoking produces no appreciable effect upon the tongue, it cannot be said to predispose to cancer.

A large majority of cases of cancer of the tongue are preceded by an abnormal condition of its surface which has been described under the various names of psoriasis, tylosis, ichthyosis, leukoplakia, keratosis, and leukoma. The term leukoma was first suggested by Mr. Jonathan Hutchinson, and is the one usually employed. The designation chronic epithelial glossitis, proposed by Besnier, would appear, however, to be a better one, as indicating its nature.

Leukoma is a chronic inflammation of the superficial mucous membrane of the tongue, which becomes deprived of its natural covering of papillæ, and instead of its normal red color it becomes bluish-white. The surface of the tongue becomes smooth and glazed, here and there marked by shallow furrows. The general appearance of leukoma is not unlike the effect produced by the application of nitrate of silver to the mucous membrane. The patient is not unusually much annoyed by the conditions present. Frequently he may be wholly unaware of their existence. In a patient under my care at the present time with leukoma of the tongue which is known to have existed for six years, the dorsum looks as if it had received a thin coating of bluish-white paint, and is mapped with delicate furrows. At one spot, about six mm. square, the tongue is uncovered, and is unnaturally red and somewhat raw. This patient has known for years that something was wrong with his tongue, but it gave him little trouble beyond a slight smarting at times, until about twelve months ago, when ulceration of the tongue ensued. When he first came under my observation, there was a fissured ulcer of the left anterior border of the tongue, with induration and thickening of the same side sufficient to interfere with distinct articulation.

Leukoma of the tongue is never seen before twenty years of age. It may originate from syphilis or from an irritant, as rough and jagged teeth, smoking, or spirit-drinking ; but however produced, it should always be regarded as a predisposing cause of cancer. The first appearance of carcinoma may vary within very wide limits. It may commence as a fissure or ulcer, a pimple or tubercle, a wart or warty growth, more rarely as a lump or nodule in the substance of the tongue. There is ample proof that many of these forms of disease in which cancer first appears, are, in the first instance, and even for a long time after, simple non-cancerous affections, but which being subject to irritation gradually pass over into cancer.

This transition from a simple into a cancerous condition has been described by Sir James Paget as the pre-cancerous stage of cancer, and Hutchinson, Fournier, Butlin, and others have emphasized the frequency with which non-cancerous lesions of the tongue undergo cancerous degeneration. Hutchinson has traced, on more than one occasion, the gradual formation of a cancer from a simple ulcer or wart, and has shown how large a part the application of a caustic plays in the "breeding" of such cancers. Among the most common sources of irritation to which simple lesions of the tongue are subjected are irregular and rough teeth, smoking, spirit-drinking, and, above all, the application of a caustic, as the nitrate of silver. According to Butlin and Hutchinson, if there is one means more certain than another to transform a simple into a cancerous sore, it is the use of caustic, such as solid nitrate of silver, so commonly employed.

No clear line of demarkation, either clinically or histologically, can be drawn marking the transformation of a simple into a cancerous condition. The value of the microscope in this connection has probably been somewhat overestimated. Numerous cases have been reported where distinguished microscopists were wrong in their opinion, and what was presumed to be cancer turned out to be gumma. Moreover, a rapid spread of the disease is often seen after removal of a piece of the tongue for diagnostic purposes. When it is done, the surgeon should operate at once if necessary. Mr. Hutchinson recommends that the microscopic examination should be made after, and not before, removal of growth. According to Mr. Butlin it is not necessary to remove a piece of the tongue in case of ulcer; scrapings from its surface can be used for examination under the microscope.

Any apparently simple lesion of the tongue which does not yield to treatment, after every source of irritation has been removed, should be excised at once, even in the absence of definite signs of cancer. Delay until the disease is fully developed is fatal, and takes away all chance of complete recovery from the patient.

When fully developed, lingual cancer, while widely different in different cases, presents a striking clinical picture. The increasing ulceration and induration, the pain often referred to the ear or temple, the salivation, the fixation of the tongue from infiltration so that it can no longer be protruded from the mouth, the enlargement of the lymphatic glands beneath the angle of the jaw, the gradually increasing difficulty of speech and swallowing, the not infrequent hemorrhages and the progressive exhaustion mark the onward march of the disease.

The *diagnosis* of the affection at an early stage is most important, but of far greater importance is the recognition of the pre-cancerous stage. Curtis has lately shown that after operations for lingual cancer, in only 6.6 per cent. of cases does the disease not recur at the end of four years, and the proportion of cures after operation will always be comparatively few. The hope of surgery for the future in regard to lingual cancer lies in prevention rather than in cure (Butlin), and as the pre-cancerous conditions become more easily recognized by those who have the earliest opportunity of seeing them, and as the best methods of dealing with them and removing them at an early stage, if they do not yield to treatment, are more generally appreciated, so we may expect to see a decrease in the number of cases of lingual cancer.

The diseases with which cancer of the tongue is most likely to be confounded are syphilitic lumps and ulcers, tuberculous ulcers, warty tumors, and simple ulcers and fissures.

Simple ulcers and fissures heal rapidly without treatment when the source of irritation is removed, or under the use of simple applications. Should they not do so, cancer should be suspected, and they should be excised at once. There is one form of simple ulcer, the dyspeptic ulcer, which is not unfrequently met with, and which, while it improves under treatment, is prone to recur. It is superficial and without induration, usually multiple and appearing in successive crops. It is not likely to be mistaken for cancer.

The diagnosis between cancer and tuberculous ulcer of the tongue is often most difficult. Butlin quotes Nedopil as saying that the four tuberculous ulcers he had met with had all been cut out under the mistaken idea that they were cancer, and the diagnosis was only made after operation. Hajek has lately reported from Professor Schnitzler's clinic at Vienna, a case of tubercular ulcer of the tongue with concurrent tuberculosis of the larynx and lungs. A histological examination of a portion excised for the purpose failed to reveal the tubercle bacilli.

It is probable that some of the more brilliant cases reported, where life has been prolonged for many years after removal of the tongue for cancer, were tubercular and not cancerous. The mistake cannot be regarded as a serious one, the best treatment of tubercular ulcer being by excision. A less extensive operation, however, would probably be indicated in most tubercular cases.

Tubercular ulcers are always secondary to deposits of tubercle in the lungs, and when a patient presents himself with an ulcer on the tip or side of the tongue, with no history of syphilis and with unmistakable signs of phthisis, we should suspect that such ulcer is tubercular.

Secondary syphilitic affections of the tongue would probably seldom or never be mistaken for cancer, and in chancre of the tongue the early glandular involvement and the development of the secondary symptoms will make clear the nature of the disease.

The points of resemblance between cancer of the tongue and the lesions of tertiary syphilis, however, are so numerous and striking that it is sometimes impossible to distinguish between them without the administration of antisyphilitic treatment, which in case of a shadow of doubt should always be employed. The difficulty which sometimes attends the diagnosis of lingual cancer from the ulcerations of tertiary syphilis is shown by the history of the following case :

Mr. T., aged thirty-six, merchant, was referred to me by his dentist for an intractable ulcer of the tongue of about four months' duration. Upon examination, the dorsum of the tongue presented the typical appearance of leukoma, with a fissured ulcer situated near the middle of the left border. The left half of the tongue was indurated, and nearly twice the thickness of the right. For the past two weeks there had been aching pain in the left ear. The ulcer was little, if any, painful, discharged very little, and presented a slightly raised base with the surrounding tissues somewhat angry. The glands beneath the angle of the jaw were apparently not enlarged. There was a family history of carcinoma, an uncle having died from cancer of the lip. Syphilis was denied absolutely. The patient smoked cigars and drank alcoholic liquor, but only moderately. The teeth were in excellent condition, and there was no history of injury to the tongue. My diagnosis of lingual cancer having been corroborated by three of the ablest surgeons in this city to whom the case was referred for an opinion, an immediate operation for the removal of the tongue was strongly urged upon the patient. Owing, however, to some business transactions which required his immediate personal supervision, the operation was very reluctantly on my part postponed for a short period. Meantime a strict hygiene of the tongue was instituted, alcoholic liquors and smoking were given up, hot drinks and irritating foods were avoided ; a mouth-wash of a solution of borax and boracic acid was used after eating, and without the slightest expectation of any benefit ensuing, the patient was placed upon antisyphilitic treatment.

In about two weeks' time the ulcer was healed and the induration and swelling of the tongue markedly diminished, and in ten weeks it was of normal size. The leukoma had not improved.

Two weeks of antisyphilitic treatment will usually be sufficient for a diagnosis, and should not be prolonged when improvement does not occur.

Finally, there is only one method of treatment of lingual cancer ; removal by surgical operation. Operation not only effects a cure in a small number of cases, but it usually prolongs life and nearly always affords great relief. According to Mr. Barker, who has collected 218 cases of excision of the tongue for lingual cancer from the tables of Billroth, Whitehead, Rose, Kocker, and others, the average duration of the disease in cases not operated on was 11.7 months, and in those operated on 19 months, a gain of 17.3 months. The elaborate tables of Wolfler correspond very nearly with those of Barker. Mr. Treves's estimate that the immediate mortality following excision of the tongue is now about ten per cent. may be considered nearly correct. The chief causes of death after operation are septic pneumonia, septicemia, shock, and exhaustion.

# A COMPLICATED IRREGULARITY.

BY H. W. ALLWINE, D.D.S., OMAHA, NEB.

WHEN work on the case here presented was begun, the thought of giving it to the profession did not enter the writer's mind. Had such been the case, he would have preserved photographs of the various appliances used, together with casts representing different stages of the work. A careful record and casts representing the case before and after the operation were kept for private use, and are here presented.

It will be noticed that the superior cuspids were sacrificed. I advised strongly against this; but, for reasons given by the father, I yielded. I regret very much that I did so. I should have insisted on retaining these teeth.

The father, together with the patient, came to me for advice in April, 1892. After examining the mouth and taking an impression of the upper and lower teeth, I dismissed the parties, requesting their return on a stated day. This gave me time to make the casts and carefully study them.

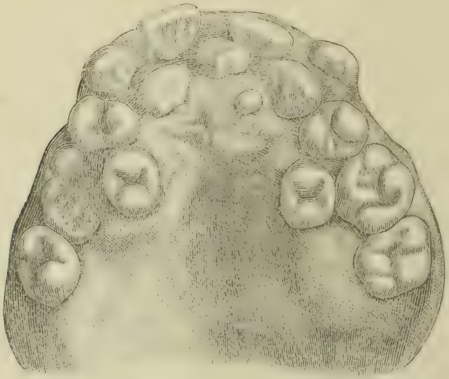
The superior right and the inferior left first permanent molars were badly decayed. To preserve the symmetry of the mouth, or rather to secure it, I determined to extract the four first permanent molars, which I did. At the same time, or shortly afterward, the two supernumeraries, one back of and extending forward between the centrals, the other between the laterals, as shown in the cuts, were also extracted. These, according to my judgment, were all that should have been removed. At this time, April 28, 1892, I also took impressions after extracting the teeth. Upon the casts thus obtained I made some of the appliances.

May 2, I put the first appliance on the inferior teeth. Of very thin German silver partial caps were made and placed upon the second molars, and a bicuspid on either side. On the buccal side of each a tube was soldered. Through these tubes, passing anteriorly from one side of the mouth to the other, was a German silver wire, having a thread cut on each end. To steady the wire and to admit of adjustment, nuts, made from a five-cent piece, were placed on the wire at the front and back ends of the tubes on the molar caps. To this wire were fastened the various devices, as the case suggested, to adjust the teeth.

Having many of the lower teeth in position; I found it difficult to retain them with the above appliance while applying force upon the others. I removed this, therefore, and made a device of rubber. It consisted of two thin rubber plates, one on the lingual and one on the labial surface, connected by thin German silver between the teeth. This fitted closely about the teeth and retained them. Where movement was yet desired the plates were cut away, and proper appliances attached. This was put on July 19, 1892.

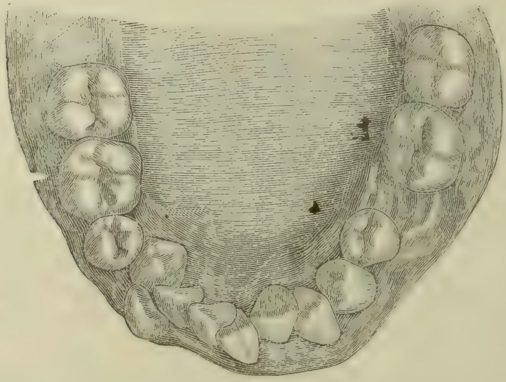
The inferior teeth being in proper position, a retaining appliance was put on August 13, 1892. It was made of two strips of metal, one on the labial and one on the lingual surface, swaged to fit about the teeth, connected by thin pieces between the teeth. This was cemented fast, and remained on the teeth until December, 1893. Nature had a great work to do in a body not so robust as was desired, hence the reason for leaving the appliance on so long.

FIG. 1.



Appearance of upper jaw of patient before treatment.

FIG. 2.

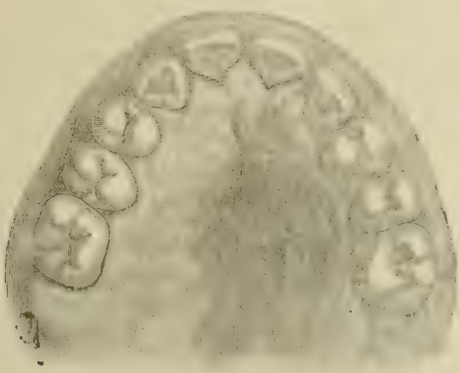


Appearance of lower jaw before treatment.

Work was being done on the upper teeth simultaneously with that of the lower. May 13, 1892, adjustment of the centrals commenced. These teeth diverged very much, as is shown in the cuts. The apices were widely separated; to draw them together required "a long, steady pull." A band was made for each tooth.

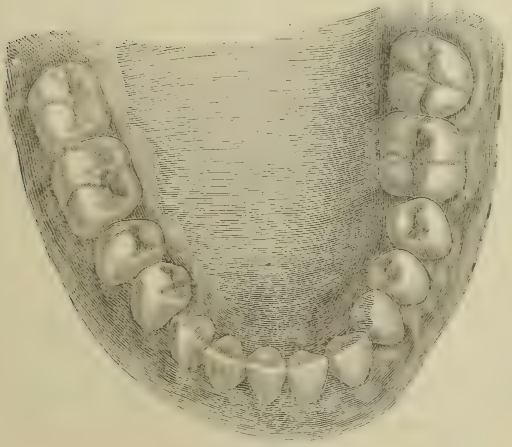
To one of these bands was soldered a piece of metal, extending from the mesial angle of one tooth to the mesial angle of the other. This gave me a fulcrum. To prevent rotary motion, a piece of metal was soldered to each side of one of the bands, and extended to the corresponding surface of the other central. Power was obtained by a band encircling both teeth, placed up to the cervical margin of the gums, the parts being connected by screws. The band was tightened, at intervals, by nuts on these screws, and held in position by loops soldered to the bands on the teeth.

FIG. 3.



Upper jaw after correction.

FIG. 4.



Lower jaw after correction.

After extracting the cuspids, an appliance was placed on the upper, similar to the first one put on the lower teeth, May 17, 1892. By elastic force the second bicuspids were rotated and drawn into place. Likewise the laterals were drawn forward. December 17, the centrals were in position, and a retaining appliance, similar to the lower, made of gold, was put on the upper teeth.

A minute and detailed description of the appliances used and difficulties encountered has not been given, that an extended article may be avoided.

In November last I placed the patient under the care of another dentist, since which time I have not heard from the case. As a great deal of alveolar deposit was required about the second bicuspids and centrals, I advised that the appliance be left on some months; and, after removal, that the teeth be carefully watched for some time.

While I have done considerable regulating, this, to me, was the most complicated and interesting case upon which I have operated. It has forced upon my mind more strongly than ever the dentist's duty to continually impress upon parents' minds the necessity of careful attention to the child's teeth, until all are erupted, with a view of avoiding irregularity.

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# PROCEEDINGS OF SOCIETIES.

## ACADEMY OF STOMATOLOGY.

A REGULAR monthly meeting of the Academy of Stomatology was held at the rooms of the Academy, 1731 Chestnut street, Philadelphia, January 8, 1895; the president, Dr. Jack, in the chair.

After the transaction of routine business, Dr. S. H. GUILFORD presented to the library of the Academy certain publications donated by Mr. Charles F. Wells, and said, "At the meeting recently held in Philadelphia to celebrate the fiftieth anniversary of the discovery of anesthesia, Mr. Charles F. Wells stated that he had in his possession certain documents of his father's that were out of print, and very kindly offered to send me copies of such as he had. I desire to present the following publications to the library in the name of Mr. Charles F. Wells: 'Dr. Wells's Discovery of Anesthesia,' published in 1870; 'The Discovery of Horace Wells,' 1850; and an 'Essay on the Teeth,' by Horace Wells, 1838."

The secretary presented a specimen consisting of an unusually large deposit of tartar attached to a dental plate, donated to the museum by Dr. Ford, of Toulouse, France. By vote the secretary was requested to convey the thanks of the Academy to the donors.

The paper of the evening was then read by Dr. E. W. STEVENS, of Philadelphia, on the subject "Cancer of the Tongue."*

### *Discussion.*

Dr. H. H. BURCHARD. Dr. Stevens states in his essay that heredity appears to play a small part in the origin of carcinoma. I remember Professor S. W. Gross placed the percentage as a low one; but there does appear to be a special diathesis connected with carcinoma, for all who are subjected to the same sources of local irritation are not victims, and in several individuals some local disease process may arise and show for a time the same conditions, but in one carcinoma results and in others not. Carcinoma itself is a proliferation of epithelium in lymph-spaces and lymph-tracts; thus, the anatomical condition separating benign and malignant growths is that structure indefinitely described as basement membrane, a membrane composed of skin or gland, that being the barrier between the lowest layer of epithelium and lymph-spaces. It does not seem inclusive enough to ascribe, as Cohnheim does, the origin of leukoplasis to nests of embryonic cells, but undoubtedly this is a rational explanation in some cases. The present hypothesis of microbic origin is by no means conclusive.

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* For Dr. Stevens's paper see page 181 of this number.

In the invaginated epithelium of the embryonic jaw, which forms the enamel-organ, we see the sharp line of demarkation between epiblastic and mesoblastic tissue, and see how the line remains unbroken; but why epiblastic tissue should break from its restraint and proliferate in the spaces of mesoblastic tissue, is one of the most vaguely comprehended problems of pathology.

I have heard Dr. Stevens and other surgeons express themselves as skeptics in regard to the value of microscopic diagnosis of neoplasms, but I have the records of two cases to add as supplemental to his, which will serve to demonstrate that clinical diagnosis may be equally undeterminate; in fact, it scarcely needs argument to prove that it must be more so.

The first, a gentleman of about fifty years, was referred to me by the late Uriah Kirk. The patient had upon the left lateral aspect of the tongue, about midway, an ulcer, say one and a half inches long, one inch broad, elliptical; hard, raised edges, almost indurated; gray, pasty base, and giant granulation; shooting pains along the inferior maxillary nerve, but no lymphatic involvement.

He denied syphilis, and no history even pointing to that malady could be elicited. I extracted the stump of the third molar, rounded and smoothed the lingual cusps of the second molar, gave him a salicylic acid mouth-wash, stopped his smoking, and in three weeks recovery followed.

I was almost certain that the disease was epithelioma; in fact, a surgeon had so diagnosed it. My treatment was designed as tentative, pending a consultation with Professor Garretson.

The second case, a gentleman for whom I was about to do dental service, spoke to me of an angry-looking ulcer of his tongue; this was about the size and had the appearance of the preceding one, except that it was more circumscribed, and the induration and giant granulations more pronounced. A surgeon had been making applications of nitrate of silver. There was no family history of carcinoma, but little induration, no lymphatic involvement, and no pain. No history of syphilis. He desired that I treat him. The teeth were smoothed, tobacco and spirits prohibited, and potassium iodid, eight grains three times a day, prescribed. In ten days no change whatever, and I referred him to a surgeon. One-third of the tongue was amputated; sections demonstrated the disease to be epithelioma. The wound healed well, but in three months the disease recurred, this time appearing on the other side of the tongue, and in a few months death resulted.

In this case were none of the symptoms of carcinoma other than giant granulations, and yet it proved to be cancer; in the other were the symptoms and appearance of malignancy, and it proved to be benign.

Dr. M. H. Cryer. I have very little to say on the matter of the paper, as I coincide almost entirely with the views expressed. I would like to ask Dr. Stevens what was the mouth-wash used in the case of which he spoke. He spoke of putting him under specific treatment, using a mouth-wash.

I infer that he makes no line of demarkation whatever between ulcer of the mouth and carcinoma; he also recommends surgical interference at a very early period. If there is anything in the germ theory, and we have an ulcer that forms a ground or nidus for germs to take root and produce a growth, if we should amputate do we not make more ground or more of a sore in which the germs may proliferate, and would not death ensue much sooner?

In regard to the use of nitrate of silver, I have had a little experience where it has been used in patients who have been sent to our hospital. By discontinuing the use of nitrate of silver, and putting the patient under other treatment, using a wash or the powder of subnitrate of bismuth, I have seen the cases much benefited.

Dr. James Truman. This matter is of considerable importance to dentists, although I don't profess to know much about it, as very few of us have anything to do with cancer of the mouth, and especially cancers of the tongue. But, passing along through life, I necessarily have come across a number of such cases, and I have been impressed with one feature in relation to epithelial cancers,—viz, the tenacity with which many so afflicted hold on to life.

Ordinarily, in tumors of the mouth, I think it is very difficult to distinguish between those which are benign and those which are malignant. I had a patient who had a benign epithelial growth in the mouth for years and years. He wanted to know my opinion about a surgical operation, and I advised against it; he finally died by accident; it never gave him any trouble.

Another case that came into my hands was decided epithelial cancer. As I would not think of treating such a case in the ordinary way, I sent him to a surgeon, who operated for its removal. I saw the patient afterward, and he was doing very well; but how long will that individual be likely to live? The growth will recur in ninety-nine cases out of a hundred.

Another case of epithelial cancer, not on the tongue, but on the lip: the man who had it outlived two of the surgeons that operated on it; both died; he was then in care of the third one. The entire anterior portion of the jaw was gone when I last saw him, but he was then starting into a new business. He died, however, in the course of two or three months.

It seems to me that we as dentists are not careful enough in our treatment to remove all rough places from the mouth. I am one of those who believe in heredity. I believe that persons may have alteration of the tissue in such a way that it may easily become deranged by any irritation that may take place upon its surface. Of course I know that the general idea is that phthisis and all other diseases of that kind are not and need not be necessarily caused by irritants; that it is simply derangement of the tissue. The same thing occurs, I think, in cancerous affections.

Dr. Stevens. I would say that the application I used in this case, and which I usually use in these cases, is a solution of ten grains of chromic acid to the ounce of water. It seems to remove pain and act beneficially. The treatment employed by the patient, and the wash that was given, was simply a solution of borax and boracic acid.

In regard to the question raised by Dr. Cryer, as to amputating some of the tongue and furnishing a nidus for a new growth of carcinoma, it must be said that, although the beginnings of cancer are micro-parasitic diseases, although that has attracted a great deal of attention during the last few years among Russian biologists, the question of the etiology of cancer is one of the least understood questions of pathology, and there never has been a parasite or bacterium of cancer isolated by the microscope. Neither have they been able from bacteriological culture to inoculate any of the lower animals so as to produce carcinoma. This leaves the question unsettled as to whether it is a parasitic disease ; it would be regarded as pretty good hypothesis that it is, but it has not been established by any manner of means.

The literature on the subject is enormous, but the question has not been settled. I thought it would be better to leave that question out of the paper entirely. You will understand that a paper upon so large a question as this is simply touching upon the surface of a very large subject. Those who have charge of the mouth are the ones who will best observe these various conditions which I have endeavored to describe to-night. There is a good deal to be learned about it, and it is only by observation that we can finally procure some information about it. The question of leukoma of the tongue is something not very well known to medicine. It is only of late years that it has been regarded as a predisposing cause of cancer. Many of the surgeons—Dr. Keen, for instance, and Dr. White—regard it as more significant of cancer than ulcer of the tongue. A most extended series of observations was made upon this subject by a German, Dr. Zimmer, who found about ten cases in five thousand. I have seen the condition several times myself ; two cases referred to me by Dr. Jamieson. One case a few weeks ago of syphilitic origin, undoubtedly ; it seemed it was previously treated with nitrate of silver, which surgeons universally condemn. This patient suffered with tertiary syphilis ; his body was covered at the time with rupia.

Dr. TRUMAN. Why do you use chromic acid instead of nitrate of silver? What is the object, especially?

Dr. STEVENS. It is a question of expediency ; nitrate of silver seems to act as an irritant. It does very well in ulcers of young people, especially children ; but experience has shown chromic acid to be more beneficial than nitrate of silver. It has been found by experience that nitrate of silver acts as an irritant, while it has been shown that chromic acid does not ; the rationale of it I would not undertake to explain.

Dr. TRUMAN. The reason I ask is that, in my experience with chromic acid, it burns absolutely the albumen of the tissue ; whereas nitrate of silver penetrates very deeply, coagulating very deeply, and I wondered whether that had anything to do with why chromic acid should be preferred to nitrate of silver. It seems to me chromic acid, because of its burning superficially and destroying the tissue, would be preferable to nitrate of silver.

Dr. STEVENS. Chromic acid acts as a superficial caustic, and those who are working in diseased conditions of the nose very well know there is a great deal of defective information regarding the use of chromic acid. It is a superficial caustic.

Dr. KIRK. Will Dr. Stevens describe the characteristic features of the condition known as leukoma of the tongue somewhat more fully than he has in his paper?

Dr. STEVENS. It is a pretty hard matter to answer Dr. Kirk's question fully. I endeavored to have a couple of patients here to-night, but as they were both specific cases, they did not care to be exhibited. Mr. Rau made photographs for me of these cases, but as they do not show the condition, I thought best to leave them at home. It is really a superficial inflammation of the tongue—superficial chronic glossitis. The tongue loses its natural papillæ, and becomes glassy and smooth. It is not a coating of the tongue or anything like a fur on the tongue, as we frequently see, but it is an affection of the superficial mucous membrane, and is soft. As I stated in the paper, it looks as if it had been brushed over with a layer of nitrate of silver.

Dr. KIRK. Does it extend beyond the tongue or encroach upon the rest of the mucous membrane?

Dr. STEVENS. It may extend from the tongue to the other mucous membrane, particularly that of the cheeks where the teeth come together, opposite the junction of the tongue and teeth, and may sometimes be observed on the gums, also. It is very much like smoker's patch. In the mouths of those who smoke a pipe and never change its position in the mouth, letting the smoke come in contact with the same place, the tobacco-smoke acts as an irritant, and produces local inflammation of the tongue, which is practically leukoma of the tongue; it is, however, of a darker color, and usually, in the cases I have seen, the coating peels off and leaves the tongue raw, at times; but this condition known as smoker's patch is the same condition as that known as leukoma of the tongue.

Dr. TRUMAN. Doesn't it amount to ulceration underneath?

Dr. STEVENS. It predisposes the tongue to ulceration. In some places this leukoma peels off and leaves an open patch, which after a while becomes covered over again.

It is difficult to describe this condition so as to make it plain to you. I had hoped to have two cases here, two beautiful specimens to show you.

Dr. CRYER. About eight years ago a patient came under my charge with what was then pronounced a carcinoma of the tongue, and it was the intention to have an operation performed. It was recognized by Professor Garretson as leukoma of the papillæ of the tongue and cheek. It commenced about the median line of the tongue, and extended over the surface of the left alveolo-lingual border into an open space, where a second and third molar had been extracted, onto the cheek, covering the whole region to the line of Well's duct, and it had, especially on the cheek, the glassy appearance Dr. Stevens described, and it was thought that at that point it might become malignant; for that reason the operation was suggested. Instead of the operation, the patient was placed upon a hygienic diet, and nothing was used on the parts except nitrate of bismuth painted over with a camel's-hair brush. The patient commenced to improve, and within six months had perfect comfort. He comes to the hospital every three months, and if there is a little patch having an angry look it is simply painted over with nitrate of bismuth. It is now, I believe, eight years that the patient has been thus carried along comfortably.

Another patient reported two years ago with very similar conditions; after treatment of about three months he left the hospital, and we have not heard from him since, and presume he is well; he was apparently quite well when he left.

Dr. JAMIESON. During the last four years I have referred three patients, one to the late Dr. Agnew and two to Dr. Stevens. The first was fifty years of age, and I had been doing dental work for him. He had an angry-looking sore on the median line of the lip. He was an inveterate smoker, but I won't say this had anything to do with it.

I asked the patient how long he had been suffering with the sore, and he said several months. Being a friend and being interested in him, I recommended him to go to one of our surgeons at once. He seemed to think it was of no importance, and went to Atlantic City, and in three or four months' time it gave him increased trouble. Dr. Reed and the late Dr. Agnew removed a portion of the lip. He came to have some dental work done some time after, and there was a small portion that had not healed; I had considerable difficulty in doing the work. He went to have a second operation performed and have more of the lip removed. He had three operations performed altogether, and in the course of two and a half years from the time I called his attention to the sore, he died.

His father died, I believe, of a cancerous growth, but instead ot heeding my advice earlier, to call upon a surgeon, he did not do so.

I think a function of the dentist is to be on the lookout for these conditions, and recommend the cases at an early period to a specialist. In one patient, thirty-five years of age, I had noticed, instead of the glassy appearance Dr. Stevens describes, an appearance more like the cicatrix from a burn, although it did not have that color, but something more like lead color.

There was also the same condition upon a line running antero-posteriorly to the lip where the cheek conforms to the teeth. I referred the case to Dr. Stevens, and he was put under treatment, and in a short time his tongue improved. Two of the most prominent surgeons of Philadelphia recommended that the tongue be removed. It was like a thunder-bolt out of a clear sky, and upset him very materially. He put it off, and made such improvement under the treatment that it was not considered well to have the operation performed, and to-day he is better and more comfortable than for many years.

The speaker further said that four months ago he had referred a gentleman from Chicago to Dr. Stevens, and upon seeing him a short time ago had reported that he had not been as well for a good many years. He had been treated in New York with nitrate of silver and had gotten worse, but under chromic acid and anti-syphilitic treatment is now a comparatively well man. In both cases the men were very thankful that they had escaped the surgeon's knife.

On motion of Dr. TRUMAN, a vote of thanks was tendered to the essayist, and the subject was passed.

## CASUAL COMMUNICATIONS.

Dr. BURCHARD. The revival of the interest in the uric-acid origin of phagedenic pericementitis, due to the essay of Professor Peirce, in which he demonstrated a relationship between the two conditions, has led most of us, no doubt, to a more careful search for arthritic history of patients who are the victims of pyorrhea alveolaris.

In some fifty cases which I have seen, among my own patients and those of other dentists, there has been found an undeniable history of gout in more than half. In some were marked hereditary manifestations and acute outbreaks ; in others, a rheumatic (or what was called rheumatic by the patients) history. Some, in whom no evidence of what the text-books of medicine describe as even obscure gout, were unmistakably the subject of the American gout, lithemia, the type of disorder graphically described by Da Costa in his "Medical Diagnosis."

It has been denied that the origin of the dental disease is ever found at any point other than the gingival margins. Professor Peirce's descriptions show the contrary ; and, to add to his list, I have just seen a patient of Dr. Gilliams, who had the type of teeth which fall victims to this disease ; dense tissues, dental, alveolar, etc. Over a superior lateral and central incisor, near the apices of the respective roots were swellings, apparently abscesses ; marked fluctuation at the summits of the swellings, and some turgescence surrounding, but at the gingival margin the dental ligaments were undetached, and for half an inch above there was no evidence of inflammation. On incision through each swelling a free flow of blood followed, but apparently no pus ; unfortunately, my microscope was not at hand and this question remained undetermined, the blood flowing as freely as though a small vein had been incised. Passing a small scaler through the openings made, there was found a loss of alveolar process and a marked roughness of the roots.

The patient had been seen some time before, and tartarlithine prescribed, and the swellings which were present disappeared. The swellings reappeared exaggerated, coincident with an attack of acute muscular rheumatism. A rheumatic family history was obtained ; a sister of the patient, a rheumatic, had lost several teeth through this process.

It seems that the results of the investigations as to this disorder must lead to renewed inquiry by the general pathologist ; for this disease, associated as it is frequently and unquestionably with true gout, the arthritis of classical symptoms ; the same dental manifestations are present in a series of disorders, most of which are described by Haig, in which an anti-gout treatment removes the general symptoms and ameliorates those relating to the teeth. The general manifestations are chronic gastric catarrh, hepatic disorders, forms of anemia, renal diseases, and catarrhs in general ; in all of which there is undoubtedly a close association with uric-acid retention.

I desire also to make a record of my experience in the use of salol.

Since the publication of Dr. Mascort's excellent paper in the DENTAL COSMOS on "Salol as a Root-Filling," I have been using that substance almost exclusively for this purpose, and as far as some ten months of trial can prove, with uniform success. A solution of sodium peroxid is first used to saponify fatty material, dissolve and drive out the contents of the tubuli. This is neutralized by a weak solution of sulfuric acid, followed by thorough drying with alcohol and hot blast; then with a pair of long-pointed dressing pliers a portion of crystals is taken up and held above a small flame until it becomes fluid. The closed points are then placed as high up the canal as possible, and slowly opened; the fluid runs up the dry canal. An iridium broach warmed is used to pump the salol to the apex, and in the still fluid material a point of metal or gutta-percha is thrust. This is used in the event of reopening of the tooth ever becoming advisable. By warming the point it may be withdrawn, and with it the melted salol, rendering access to the apex easy. Experimenting with teeth out of the mouth has demonstrated some difficulty in removal where a central mass of other material has not been used.

Dr. KIRK. I desire to bear testimony to the value of salol as a root-filling material. Since the publication of Dr. Mascort's paper —and for a month previous to that, because I had the paper in my possession fully a month before it was published—I have used nothing but salol for filling roots in my practice. I have, in some cases, used it in connection with a gutta-percha point, but generally without it. It crystallizes solidly in the canal. When it is melted and introduced into the warm, dry canal, it apparently flows into the uttermost extremities of it. It has a fluid character like melted paraffin or the paraffin oils, and in a few moments it crystallizes. I have yet to have the first case of apical pericementitis follow a case so treated, although I have been almost, you might say, careless in the use of it; that is, I have used it in immediate treatment of cases and those of recent devitalization, and it has been uniformly satisfactory to me.

Dr. H. E. ROBERTS. Salol melts at a very low temperature, so low that a mouthful of hot water will melt it if held there. Now, if it is melted by the use of hot drinks, would there be any absorption? Or is it dissolved in any way in water or moisture? And also, if it should melt, would there be any damage done in the canal?

Dr. KIRK. It is quite impossible to melt salol in the root of the tooth with hot liquids taken as drink. It melts at 104°, so that the danger suggested by Dr. Roberts would be eliminated, and it is only slightly soluble in water. A fluid at 104° would drop very quickly in temperature when taken into the mouth.

Dr. ROBERTS. Slightly tepid water would melt salol, and some women drink tea very hot. You think a tooth would not carry the heat from a mouthful of hot water up so as to melt the salol?

Dr. KIRK. "Slightly tepid" is a relative term. Salol melts at 104°, and it would not be affected by such means. I don't believe the temperature of the roots of teeth is raised under any circumstances to that degree when hot fluids are taken into the mouth.

Dr. MCQUILLEN. I have been using salol, and have been perfectly delighted with it. In regard to what Dr. Roberts said, the salol is sealed in the tooth thoroughly, and if it did melt it would not make any difference; besides, I don't see how it would be possible to keep anything hot in the mouth long enough to melt the salol in a root. If it did, it would crystallize again when the temperature became normal. I have never had anything that has pleased me quite as much in root-filling.

Dr. J. C. Curry. Would Dr. Kirk use salol where the apical foramen was unusually large? Would salol be an appropriate remedy to use there?

Dr. Kirk. I cannot recollect having used it in any such case as that; occasionally we have cases of open foramen, but they are not usual. I don't think I should hesitate to use it. Dr. Mascort has described the use of salol in a case where caries had perforated the floor of the pulp-chamber, exposing the periosteum of the alveolus. If it would operate successfully in such a case, I see no reason why it would not in a case of open foramen, although it might be better to use a gutta-percha cone in connection with the salol.

Dr. Deane asked if Dr. Kirk thought there would be any danger in forcing salol through the apex where it was open.

Dr. Kirk. I should not want to force anything through the apex. If I had to force anything through, I would prefer it to be salol to almost anything else of which I know; it must be used carefully and dextrously, so as to avoid any such action. That is an accident to be avoided in all canal operations.

Dr. Deane. There are some roots through which we force medicine; for instance, in the treatment of a fistula.

Dr. Kirk. I should prefer forcing a liquid medicament through in a case of that sort.

Dr. Deane. After that, would there be any danger in forcing salol through?

Dr. Kirk. I should think not, if carefully used. Dr. Burchard uses a method somewhat different from that which I use. I use a Donaldson bristle to introduce the salol, first carrying the bristle to the apex of the root as nearly as I can; then with long pliers I carry the liquid up, and, having the broach in position as I introduce the salol, I slowly withdraw it so that I get the salol drawn into the space previously occupied by the instrument. There is a better chance by this method, I think, of carrying to the apex. It can be readily pumped into a canal with a broach armed with cotton. It is a difficult matter to pump salol in liquid form vertically into a root-canal, but it will flow by capillary attraction, which carries it upward, so we are reasonably certain, as certain as anything can be, that we have filled to the apex; that, of course, we never know absolutely until such a tooth is extracted and examined.

Dr. Guilford. I have used salol in a way not mentioned here to-night. I used it in two cases where the teeth had been knocked out and had to be replaced. I found, in introducing it through the apical foramen, by using a small bristle something like the Donaldson bristle, it worked in nicely without necessitating enlargement of the canal. One of these cases has been in over a month. I simply call attention to the fact that it is much more easy of introduction through the apical foramen than gutta-percha or gold.

Dr. Kirk. Where I have used it in cases of filling roots of teeth for implantation, I have used a very small drill to enlarge the apical foramen and a hypodermic syringe to inject the salol into the tooth. By using a warm syringe and injecting the liquid salol into the root-canal from its apex, I believe it makes an excellent filling for such purposes. I have only had these cases of implanted teeth thus treated under observation for a short time.

Dr. H. C. Register. I want to place myself on record as having used salol. I have used salol as an antiseptic, and I have also used it in connection with phosphate of zinc. I mix it in crystal form with phosphate of zinc, and insert it just as I would the plain phosphate of zinc in a canal. All of these cases, where salol has been used in connection with desiccation, which I have always, for a number of years past, carried out, have given me very good results.

There was one case, which occurs to me, of a gentleman with a very small mouth, where I had to treat a second inferior molar, and had to approach the pulp-chamber from the buccal wall. I tried to fill the tooth, desiccating it first with salol and phosphate of zinc, but I never could make a perfectly comfortable tooth of it. After I found that salol could be melted so easily, I decided to seal it up permanently with melted salol. Keeping the tooth dry and desiccating it thoroughly, this was done. The apex of the root was open, so that it would sometimes bleed right through from the canal, and yet the salol root-filling has worked very satisfactorily.

I operated on this case, which had been a very troublesome one, and it has now been six or eight months, and there has not been the slightest trouble with it.

In all these cases I use no gutta-percha. I simply, after desiccation, fill the canal and a part of the pulp-chamber with the dry crystals, packed down into the canal as tightly as I can pack the material with an instrument, and then apply a small nerve-instrument, warmed slightly, which as soon as it touches the salol liquefies it. As it becomes heated the material will pass into the most infinitesimal space, and almost as soon as the instrument is withdrawn the salol solidifies into a hard, crystallized mass.

In putrescent cases I use heated air and desiccate thoroughly. I then do not hesitate to melt the salol right into the canals, and fill the tooth. I have no trouble from the cases at all.

In answer to Dr. Guilford, Dr. Register stated that he mixed the crystals of salol with the oxid of zinc before combining the latter with the phosphoric-acid liquid.

Dr. Kirk. I would like to ask if any one has used formol, or formalin as it is also called. Dr. Mascort called my attention to the use of it in the St. Louis Hospital, of Paris, I think, by a surgeon there, who had, in connection with the public clinic, a great many cases of alveolar abscess, etc., which were treated almost indiscriminately with formol. I had sent to me a bottle of formalin from Schering, of New York, and have been testing it in my work occasionally. At times I have found it a little too violent in its action, but by diluting it somewhat I get very satisfactory results from it. Dr. Mascort, who suggested salol as a root-filling, was quite enthusiastic over the use of formol as a root-dressing for putrescent cases, and I am favorably impressed with its use in controlling putrescence and as an antiseptic. It is very penetrating. It is used in the hospital wards on the continent for spraying the walls, washing clothing, etc. The vapor makes a very efficient antiseptic ; it is very penetrating when vaporized in a room, and a very small amount is destructive of germ life. The odor somewhat resembles that of the allyl compounds, onion, horseradish, mustard, oil, etc. It seems to me well worthy of investigation as a root-canal dressing.

Dr. Louis Jack. Shortly after the use of formalin was suggested to me by Dr. Kirk, I made an application to a case which had been opened at the seashore during the summer. The dentist in charge of the case had made a mistake in the diagnosis, and assumed there was irritation in a certain tooth, and he destroyed the pulp and left the case open ; the result was considerable disturbance in the apical region. The tooth had become so seriously affected that it would not allow closure ; an ordinary cotton stopping would bring on, in a few hours, quite a serious disturbance, so I was obliged to leave it open and close it for a few hours only, and then open it. I employed a solution of formalin, diluting the ordinary solution to a five per cent. solution, and on the second application I was able to close the tooth at once with gutta-percha, and in a few days afterward filled it, without any further disturbance.

Dr. Jack further stated that he had used it in cases where he formerly used hydro-naphthol, but that he would warn any one against using it in a greater per cent. than five per cent. in pulp-treatment, on account of its irritating influence.

Dr. Roberts asked if the practice was to seal the formalin in the tooth, or is another dressing put in afterward.

Dr. Jack. In the case just reported, the only putrescent case in which I ever used it, I allowed it to remain in several minutes, then removed it and applied aristol and gaultheria. I had previously applied aristol and gaultheria without any impression having been made.

Dr. Darby. Does Dr. Jack think he would have had as good results if he had used hydro-naphthol, or did he use it?

Dr. Jack. I did not, as I would not consider it as active as aristol and gaultheria. I might state I have found formalin at ten per cent. quite an irritant.

Dr. McQuillen. I would like to ask if any of the members have used Dr. Schreier's preparation, sodium-potassium? I have been using it since September of last year, and the results have been so uniformly successful that I think with one exception it has never been necessary to again treat the tooth after thoroughly burning out or saponifying the putrescent matter in the pulp-chamber and canal. I have never had to use it a second time. One case I recall was sealed last September a year,—a lateral incisor in which the pulp-canal was positively filled with pus. It was the first case in which I used the Schreier preparation. That tooth has been sealed ever since, and that is only one of many cases.

Dr. Kirk gets the same effect, I believe, with sodium peroxid ; but I have never used that, as this sodium-potassium has helped me so fully. There is one objection to it. Unless you are careful not to use too large an amount, you are likely to have an explosion, the material going off like a fire-cracker, though no harm is done ; only it causes a surprise.

Dr. Curry. I have used it, but have lately abandoned it for sodium peroxid, as I like it better. It is easier to manipulate, and I get the same results.

Dr. Kirk. There is a subject, brought up by Dr. Burchard, that has been passed over without discussion. If I remember correctly, in one of the early meetings of the Odontological Society there arose a discussion as to whether it was possible to have an abscess upon a vital tooth, and the meeting was considerably divided on that question. Dr. Burchard has called attention to a series of cases in which he had something similar to abscess on a vital tooth, the etiology of which he assigns to conditions of gouty or rheumatic diathesis.

I have had an exceptionally good opportunity, during the past ten days, to observe the whole period of inflammatory action of this character in the shape of an abscess in my own mouth. Two Sundays ago, and for some time afterward, I was unable to get my jaws together, because of inflammation associated with a lower third molar. The inflammation was distinctly localized in the gum, on the buccal aspect. So far as I could determine by the sensation, by probing, etc., the inflammation was probably half-way down the side of the buccal aspect of the root, and accompanied with pain that almost incapacitated me from work for the time. It is such a pain as any one who has had an alveolar abscess knows a great deal about. There was only slight swelling. It was distinctly associated with general gouty or rheumatic symptoms. I passed a blunt probe around the gingival attachment, and found its margin absolutely perfect. There was no break in it; that I am morally certain of. In course of time the abscess broke, and pus discharged from it. There is now a pocket on the buccal side of the tooth, and I have no doubt it will be, in the course of time, the seat of a pyorrheal condition, because that is a difficulty I have to continually combat.

I have the same condition repeated in an upper cuspid in my own mouth, and it may be of interest to Dr. Burchard to know that it also was coincident with a considerable manifestation of a rheumatic character. That is in my own individual case. The best way to know a thing is to know it by personal experience.

I have an exact duplicate of that case in the mouth of a lady patient of mine, excepting that the inflammation was associated with a lower second molar. I found exactly the same condition progressing there. The period through which the inflammation ran was about a week, all told. I examined the gingival margin carefully, and found no break. It was a vital tooth. I, however, removed a large filling for the purpose of determining that. I was not satisfied with sensitiveness to thermal test. I wanted to test the responsiveness of the dentine, and I found a vital pulp, and still an abscess formed on the buccal side of the tooth. There is now a large pocket extending from the gingival margin almost to the apex of the root, discharging pus freely. It has been washed out and treated, but still there is an exudation.

I report these two cases because they have both been under my observation, and one of them will, I hope, continue to be for a number of years to come; and I believe there will be a record of pyorrhea following this acute inflammatory outbreak unless that condition is cured in the mean time.

It seems to me that in these cases we have almost certainly the original lesion which induces the pyorrheal condition. I do not maintain that what I have described is the only source of pyorrhea, but I strongly suspect it to be the origin of one variety of it.

Dr. Deane. I had a case a few days since in which the condition of pyorrhea is very apparent; a discharge of pus in connection with the lower first molar on the right side, and the bicuspid on the left. I found on the lingual side of the lower right central a condition that led me to believe there was pus there, but no opening in the tissue leading down to the pus collected around the root of the tooth. I filed a broach off very thin, and passed that down around the tooth until I could feel the process, but I could not come in contact with the pus; but by opening up the sac from the lingual side I got quite a discharge of pus, and found I could pass a probe in right to the surface of the root. I believe that pus formed there without any possible chance of an opening around the cervical border of the tooth. I have placed the patient under the treatment recommended by Dr. Peirce, and shall watch the case carefully from time to time. I believe that the tooth is a live and healthy tooth. No cavity in it at all; it responds to all the tests, heat and cold, etc.

Dr. TRUMAN said he was somewhat skeptical on the point.

Dr. CRYER. I do not see why we could not have such abscesses. The tooth can be alive and have an abscess in the immediate neighborhood. An abscess connected with a dead tooth-pulp would be, generally speaking, a dento-alveolar abscess; that, of course, would involve the apex of the root. I do not see, however, why we could not have a live tooth and an abscess along the alveolar border.

Dr. GASKILL. I had a case in which I got myself into trouble by a condition of that kind; a patient presented herself having a fistula between the first molar and second bicuspid, and I could not determine from which tooth the trouble arose. Both seemed somewhat sore and responded to the tests applied; finally determining to try the molar, I drilled into a vital pulp; I then drilled into the second bicuspid and found a vital pulp there, and had to destroy the pulp in the first molar, but was able to save the second bicuspid. The fistula was healed by systemic treatment. Afterward the patient presented herself with a similar condition on the other side of the mouth.

Dr. TRUMAN. I question if proper discrimination is made between vitality of the roots; there may be vitality in one root, or even in two roots in the superior molars, and yet one be entirely dead; that very often occurs. In that dead portion of pulp, abscess will occur; sooner or later pathogenic germs will find their way into that point.

When any one talks about an abscess at the root of the tooth without an opening, or that the tooth is entirely vital, I should want to know whether all the roots are vital. One may be dead and the other fully vital.

Care should be used in making this discrimination. I have no belief that abscess could occur near the apex of the tooth, and the tooth, or that root, retain its vitality.

Dr. KIRK. In my own mouth there is not a dead pulp anywhere.

Dr. TRUMAN. Have you taken the tooth out?

Dr. KIRK. No, I have it there now, and know that the pulp is alive. The tooth has no cavity in it.

Dr. ROBERTS cited a case of abscess on apparently sound teeth.

Dr. CURRY described a case where he had drilled into a supposed dead pulp in order to treat an apical abscess with fistula, and had found the pulp entirely alive.

Dr. JACK mentioned having drilled into what he supposed was a dead pulp, but found it entirely alive, and said that twenty years ago he would not have believed as he now does, but he has seen so many cases that he is confident they do exist more commonly than some suppose.

Dr. REGISTER. Some years ago, before Dr. Peirce drew the attention of the profession to the fact that pyorrhea alveolaris had some connection with rheumatism or gout, I knew that I had rheumatism. I also knew that I had erosion of the teeth, and I knew I had what was called Riggs's disease of the gums.

Several years ago, in connection with a lateral incisor which I still have in my mouth, a small abscess formed on the root about half-way between the gingival border and the apex. It was extremely painful, and it struck me as being singular that such a condition should exist, for I felt sure the pulp was alive. I never had had trouble with it to any extent, other than that it was a little loose. I tried to open the abscess from the cervical margin, passing an instrument up the line of the tooth-root, and was unable to reach it. I then slipped a lance into it through the gum, and a small quantity of pus flowed out; since then there has been a recession of the gum up to the point where the pocket was formed. I am quite positive there was previously no opening in the gum margin, because I examined it with a mirror and instrument, and I could see perfectly what I was doing. The pulp in that tooth is still alive.

Adjourned.

GEORGE D. B. DARBY, *Secretary.*

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# UNION MEETING OF THE FIRST AND SECOND DISTRICTS DENTAL SOCIETIES OF THE STATE OF NEW YORK.

A UNION meeting of the First and Second Districts Dental Societies of the State of New York was held Tuesday evening, January 8, 1895, at the New York Academy of Medicine, No. 17 West Forty-third street, New York city.

At the opening of the meeting, Dr. V. H. Jackson, president of the First District Society, occupied the chair.

Dr. JAMES G. PALMER, chairman of the Clinic Committee, read the following

## CLINIC REPORT.

Dr. J. W. CANADAY, Albany, N. Y., demonstrated the method of preparing and condensing tin and gold when used in combination as a filling for simple cavities, emphasizing its value for young and poorly-calcified teeth.

In preparing the filling-material, care is necessary to employ equal *weights* of each metal. For convenience in use a sheet of No. 4 gold is taken, and on this a sheet of No. 4 tin is laid; these are once folded, making a half-sheet in size, again folded to one-quarter sheet size, and this finally folded on itself.

The foil is then cut in strips of a width suited to the size of cavity to be filled. Strips of the combination of metals are preferred to ropes, as permitting more thorough condensation. Cavities are prepared as for soft gold fillings. Strips of the tin and gold, as folded, are introduced in the cavities by means of suitably-shaped hand-pluggers, beginning at the distal portion of the cavity and folding the foil as the filling progresses, so that a suitable excess is allowed for final surface condensation, which is effected by means of a broad-faced plugger-point followed by a steel burnisher rotated in the engine. The burnisher first employed is the largest that is permitted by the size of cavity filled, and is applied to the center of the filling, drawing it toward the margins. The filling is finished by the ordinary plug-finishing burs in the engine, a final burnishing completing the work.

Advantages claimed are: Ease and rapidity of manipulation, admitting of the use of tin and gold in mouths of the youngest patients; permanence, the resultant filling becoming in time equal to a good amalgam in hardness; and freedom from wasting of the filling so commonly found when amalgam is employed in cavities in soft teeth.

When properly employed, tin and gold will not cause staining of tooth-structure, makes a perfect guard for gold at the cervical portion of cavities in approximal fillings, and safely and completely guards cavities in permanent molars and bicuspids till their calcification is completed.

Dr. SIDNEY S. STOWELL, Pittsfield, Mass., presented his rapid method of making partial gold plates. The impression is taken in plaster, or modelling compound, into which "Melotte's metal" is poured, forming a metal model or die. Around this die modelling compound is built, forming a cup, with die at the bottom. The surface of the model exposed is blackened with smoke from a burning match. "Melotte's metal" (as cool as it will flow) is poured into this cup, forming a counter-die. Modelling compound is removed and the die and counter-die separated. Gold plates, 32 gauge, are then swaged, making two or three duplicates, placed together and swaged, and then soldered. Hold all plates together with spring pliers.

Result, a gold plate of any desired thickness and strength at any point required, perfect adaptation to the model, as a thin plate is swaged between hard dies. Perfect adaptation to the mouth, as the plate is fitted directly upon a model taken from the impression, as in vulcanite work. Teeth-clasps and plate may all be fitted to the same model. No molding in sand or casting metals fused at high temperature; no dirt, no heavy pounding.

Dr. Stowell performed the operation in *eleven* minutes, as is vouched for by Dr. L. E. Sage, of Bridgeport, Conn., who stood beside the chair and timed Dr. Stowell.

Through the kindness of Dr. G. Lenox Curtis, Dr. Stowell also presented the same patient as at the November meeting (see DENTAL COSMOS for January, page 51). Patient had followed advice then given, had impacted third molar extracted, and reported himself completely cured.

Dr. W. S. TWILLEY, Baltimore, Md., illustrated his method of attaching and replacing porcelains in crown- and bridge-work without cracking or breaking.

The root is prepared and shaped in true contour with the alveolar process. The band is shaped parallel with the alveolus, which brings the cap when in place close down to the root. After attaching the cap piece and pin in the usual way, the porcelain is ground to fit and backed up with stout backing. Do not bend the pins, but hold in place with a little soft wax. The backing is secured to the cap with hard wax. Then by running a thin-bladed knife between the face and the backing, the face will slip out of position and leave the pin-holes open and exposed. Take black lead points, No. 4½, made by Henry Cohen, Philadelphia, cut in half, and insert a piece into each hole. Invest as in ordinary work, and solder. The solder will flow around the carbon or lead cores, which are easily removed with a fissure drill. Make a countersink in the solder with a cone bur at each pin-hole, and set the tooth in position, using a little cement, if desired, to close any possible space. Invest in hard modelling compound, and with punch and hammer rivet the pins into the countersinks. Polish and set the piece.

If a face is broken while the crown or bridge is being worn, grind off the pins to the backing and drive out the remaining part. Fit in a new face and set with cement. Hold a piece of lead or a lead mallet on the facing, and, with the automatic mallet, drive the pins down into the countersinks. This makes a head on the pins, and crown or bridge is as good as new. Replacing a facing should not consume more than twenty-five minutes.

J. W. Wassall, M.D., D.D.S., Chicago, Ill., presented his new hand-piece for electrically warmed compressed air.

Any of the compressed-air apparatuses may be used. The electricity may be from the street current or from a battery. The compressed air and electricity should both be led to the rear of the base of the chair. At that point is connected up a silk-covered rubber tube, one-eighth inch bore and about six feet long; the free end to hang from behind the head-rest. This tube contains two wires for electric conductors,—one being between the tube and its silk covering, the other in the lumen of the tube. The hand-piece screws on or off, making electrical connection at the same time in the same manner as an Edison lamp in its socket.

The essential feature of this air-warmer lies in the nozzle of the hand-piece. It is arranged to warm a stream of the air exactly at its point of delivery. This is accomplished by making the orificial end of the nozzle of porcelain, in which is imbedded a coil of fine platinum wire, one-half inch in length. The temperature of the air is determined by the air-pressure and the amount of current, which is obviously under complete control.

Dr. S. C. G. Watkins, Montclair, N. J., treated and filled the root of a superior lateral incisor which was abscessed and had a fistulous opening. He demonstrated his method of drilling the canal, which he does in such a way that he claims the canal can be made clean and treated more perfectly than without drilling. He claims that there is no more (if as much) danger of breaking a Gates-Glidden drill than there is of breaking a broach. After drilling the root, he wound some cotton on a four-sided broach, which had previously had its temper drawn. These broaches are known as jewelers' broaches, and can be obtained at any jewelers' supply-house.

With this broach wound with cotton, he pumped carbolic acid and iodoform into the canal and through the foramen into the abscess. After wiping away the excess of medicine, he dressed the canal with oil of cajuput, then inserted a very small cone of gutta-percha, which was softened with the oil remaining in the canal, after which he inserted large cones which pressed the first small piece, softened with the oil, into all parts of the canal, thus hermetically sealing the cavity.

The principle which he wished to demonstrate was the ease and safety with which canals could be drilled, and how easy it was to fill them after drilling.

He also demonstrated his method of making gutta-percha cones, and exhibited a little catch-all for the instrument-stand. It is a little blue glass cup such as druggists use for salve, about two inches in depth, with metal top. An angular hole is cut in this metal top, through which bits of cotton are readily caused to drop from the instruments used to wipe out the canals of teeth, instead of being thrown on the floor.

Dr. J. BOND LITTIG, New York city, demonstrated his method of making bicuspid and molar crowns, making a cap entirely of platinum, resembling an Evans gold crown when completed. The face being then cut out and a piece of platinum let in—or the face depressed, so as to form a cavity corresponding to the buccal aspect of a tooth—porcelain was baked in this depression, using Downie's body. After fusing the body, the platinum was fire-plated with Roman mat gold.

Dr. BURTON C. RUSSELL, Keene, N. H., used porcelain rods for inlaying. The method is as follows:

Prepare the cavity, by making it with suitable instruments, perfectly round. Then grind the side of a tapering porcelain rod, revolving it in the engine by running it against a flat wheel of sharp grit run in the opposite direction, in either lathe or engine, until the point will barely enter the cavity. The porcelain rod selected must be the exact shade of the tooth under treatment. Revolve the rod with the engine until it cuts or grinds its perfect joint and reaches the bottom of the cavity. Mark with a pencil the depth of the cavity on the rod. Remove, and cut a groove just above the mark. Introduce a light-colored thin cement, smooth, rather slow-setting, turn the rod with the finger into place, apply slight lateral pressure as it goes home, thus detaching the inlay, which hold under pressure for five minutes. After an interval of thirty minutes, dress down flush with the tooth, as one would a gold filling, omitting a high polish.

Dr. GUSTAVE P. WIKSELL, Boston, Mass., exhibited improved trephines for shaping the roots in crown-work; self-cleaning, and an improvement on the Büttner instruments.

He also exhibited Dr. H. J. Libby's set of burnish filling instruments, such as were used by Dr. Libby for sixteen years.

Dr. D. GENESE, Baltimore, Md., crowned a left superior cuspid with a "Genese" crown, with platinum pin, soldering with eighteen-carat gold; and inserted a porcelain inlay, the method being as follows:

This inlay differs from the usual character of such work in this: That less shrinkage is incurred, compactness of compound, non-liability of alteration of form secured, and a hold-fast for the cement in the inlay itself. Instead of using No. 60 gold as a matrix, No. 4 cohesive, folded once, was used. No pressure was put on this until softened wax was pressed on it, which completely filled the cavity and took an accurate impression of the margins. This was invested in Teague's compound (or an equal part of ground bone phosphate and plaster may be used). The wax was melted off, leaving an exact impression of cavity and margins. A small piece of waste gold was laid at the bottom of the matrix, and it was then poured and burned.

Protecting the investment prevents warping, and removing the gold reveals a depression corresponding to the gold, forming a reverse undercut to the one in the cavity, and adds strength to the cement which holds the inlay in.

Dr. Z. T. SAILER, New York city, exhibited his combination sterilizing box. It is primarily a sterilizer, but also keeps douche-water for the mouth at proper temperature, as well as gutta-percha, mouth-mirrors, oil of cajuput, or any medicine which may be desired for use in the mouth or on the teeth. It also has an apartment with hot water for softening modelling compound, and an apartment in which to keep instruments for working gutta-percha at an even temperature.

Dr. NELSON T. SHIELDS, New York city, demonstrated his perfect system of gold crowns with porcelain facings, showing their artistic beauty and great strength. Dr. Shields claims that by using this system of constructing the foundation for crowns, using platinum instead of gold for these foundations, heavy bars of platinum and iridium forming the frame of a bridge, the Downie furnace and body for the porcelain work, beautiful, strong, artistic and permanent bridges may be made which will not rest upon the gum.

Dr. H. W. NORTHRUP, New York city, exhibited a case where the upper teeth had been worn down until very sensitive, and the bite was restored to length and use by gold capping, and bridges to replace the lost teeth on each side of the mouth. On the right side upper the lateral, cuspid, and first bicuspid were connected, carrying two extended dummies with metal saddle resting on the gum. In the lower were two small bridges carried by gold caps, the free end of the bridge resting on a molar. There were nineteen crowns in all.

Dr. GEO. A. MILLS, New York city, presented a case of aggravated alveolar abscess; patient eleven years old, who had an inferior first permanent molar extracted the previous Saturday while in a state of acute inflammation. The case, as seen to-day, presented an unusual distension of the cheek, pointing obliquely toward the symphysis. The protrusion was fully an inch and a half, without a break on the outside. Applications were made to allay extreme sensitiveness. The patient was put under the influence of chloroform, snuffing it through the nostrils to produce analgesia *only*, thus getting him quiet, while in the beginning he was extremely nervous. The abscess was opened from the inside without a twinge of pain. It was found to be very deep-seated, and discharged copiously thick, heavy pus. After making the wound aseptic, a compress was placed on the outside, using adhesive plaster, crossing the strips under heavy pressure, and painting the whole with collodion for the purpose of increasing the tension by contraction.

The second case was that of an adult with an abscess. Central superior incisor, tooth extremely loose, discharging freely; caused by a blow, producing mechanical injury of the parts, causing tooth to elongate, throwing it out of occlusion with the lower teeth, and causing pain continually in both jaws. The parts were painted with an obtundent, then dilated with a tent, and the interior of the abscess cauterized. The tooth was then strongly ligated to the adjoining teeth, giving it a fixed position. Where the teeth came abnormally in contact they were ground off, giving a free and normal occlusion, and rest to all the parts.

The third case demonstrated the Riggs treatment with Dr. Riggs's instruments.

The fourth case emphasized putting the mouth and teeth in order. This case was presented two years ago last June in bad condition, with a free discharge about the necks of the teeth. It was treated *a la* Riggs, and the mouth brought into a healthful state. The patient had thirty-two teeth, which had gotten into a wretched state, the loss of the pulps forming abscesses in several instances, many of the teeth badly decayed, and there being a marked separation of the gums from the necks of the teeth. The teeth were put into a state of health, and restored to usefulness by perfect contour. The filling of these teeth was by a combination of amalgam and gold. Many of them were savagely decayed far up toward the process and toward the roots. About forty-eight hours' services were put upon this case. After the expiration of two and a half years, this case was presented, showing the success of the treatment.

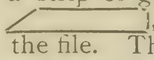
The new remedy, "Iatrol," was introduced. It is extremely interesting in general operation in oral and dental surgery. It has strong antiseptic properties. It is non-toxic and analgesic. It is believed that it will be a valuable addition to tooth-powders. It is easily soluble in warm water and in the essential oils. Macerated in oil of peppermint, in massage treatment of the gums it is very beneficial.

Dr. Geo. W. Bleegarde, New York city, exhibited the Revelation furnace for continuous-gum work, porcelain bridges, crowns, and all porcelain work pertaining to dentistry. Twenty minutes after starting the furnace, a block of Dr. Close's continuous-gum body measuring one inch square was baked in perfect condition, and then enameled and finished. Time consumed from start to finish, forty minutes. The furnace is the invention of Dr. C. H. Land, of Detroit, Mich.

Dr. E. Parmly Brown, New York city, exhibited one of his porcelain bridges of twelve upper teeth worn seven and a half years. This case is illustrated in Evans's book, Figs. 518 to 520. Inserted soon after extracting, to be worn three years. Case now replaced with new improved gum bridge, with iridio-platinum plate resting firmly on the ridge. Cemented onto three gold molar crowns soldered to bar, and one cap on cuspid root.

He also presented a patient, fourteen years old, showing ten large fillings, inserted three years ago, of "Rich with Gold Alloy." These fillings were all perfect in every respect. His crescent rubber-dam was also shown.

Dr. G. A. Bowers, Nashua, N. H., presented a practically self-adjusting gold crown, which he claimed was an improvement on an old idea and a greater improvement in method. It admits of being taken off and on for the purpose of trimming to the festoon of the gum an indefinite number of times. The fit is in no way affected by this. The open band with overlap adjusts itself to the root in the process of alignment. The overlap makes it possible of adjustment to different spaces and varied sizes of roots. The patient can bite into this plastic crown and a perfect occlusion is thereby secured. The absence of stiffness or rigidity makes burnishing to the root for final fitting extremely easy. The crown is so far ready made as to only require soldering the band, and yet is capable of a perfect fit without the use of wire, copper strip-ligature, or other measuring device. This method is equally as good in crowning a third molar as a bicuspid.

In construction, twenty-two carat plate, 29 gauge, and twenty-two carat solder is used. A cameo die-plate is used instead of an intaglio. Selecting an approximate cusp from the die-plate, the thug is driven into it. A square piece of gold is then cut, annealed, and pressed into the cusps with the fingers, then driven down with the thug. It may be necessary to anneal three or four times to secure a perfect cusp. After trimming and facing, a strip of gold the length and width required is cut, shaped thus , which is bent to approximate contour and faced with the file. The cusp is placed on the band, held with tweezers, and caught with solder. The band is then bent to the exact contour of cusp, and soldering completed. In using these crowns, select the one desired. Having the root prepared, push the crown on until it touches the gum, then take it off and trim; continue until it is in alignment with the other teeth. Let the patient bite, to secure perfect occlusion. Burnish the band, solder the seam, and fill the cusp with twenty-carat solder. As these caps fit so perfectly, it is advisable to bore a small hole in the cusp to allow the excess of cement to escape. This can afterward be filled with mat gold.

Dr. Lewis H. Robinson, Brooklyn, N. Y., presented an interesting case of tardy development of the superior incisors in a girl of fourteen years. A slight prominence of the gum was noticeable, sufficient to give the outlines of the teeth, showing them to be in position. This indication has been just as marked for a year. The opinion of those present was to let the case alone. Some thought the teeth would appear in a couple of years.

Dr. Emory A. Bryant, Washington, D. C., presented and explained his methods of making a removable porcelain bridge, showing the application of his new clasp to dentures of this description, and showing the attachments to the plate.

He exhibited a bridge (hollow) constructed of gold to imitate the gold bridges which are inserted permanently, retained in place by the clasp method. These removable bridges may rest entirely upon the tissues, or depend upon a bar inserted into a groove in each abutment.

He also exhibited an upper removable plate bridge ready for the teeth and porcelain body, the abutments on one side being the cuspid, all teeth gone back of that tooth, and the first and second bicuspids on the other, one a telescope crown, his clasps being used on the cuspid and second bicuspid, all teeth being gone back of these abutments. This is a practical case now being worn by a patient who had had eight plates made for him in less than a year, none of which he could wear.

He also exhibited a lower case to be inserted, using the first permanent molar on one side and the first bicuspid on the other, all teeth gone back of these, showing crowns and clasps in position ready for the plate and attachments.

Dr. Bryant also exhibited his methods of making permanent bridges, the facings of which are not subjected to heat in soldering the bridge together, showing both hollow and solid dummies for the bridge ; together with his method of replacing facings broken from bridges of any method by the use of instruments devised. Also his universal flask-holder, for handling flasks for rubber work, inclosing and holding the flask tightly while pouring hot water to remove the wax, taking from the vulcanizer while hot or from the pan, screwing down the bolts, etc., thus avoiding dirty hands and danger of dropping and spoiling the investment. Also various instruments devised for doing work by his methods.

Dr. C. SILL, New York city, exhibited the "dental traction engine." It is quite a new feature in dentistry. The difficulty experienced in crowning convexed crowns and obtaining adjustment at cervical portion is well known. This tensio-torsion appliance does away with the necessity of mutilating convex forms of teeth, saving time and giving less pain.

Dr. JOSEPH SPYER, New York city, demonstrated his method of filling approximal cavities by filling and building out a badly-decayed left central incisor, using soft foil No. 4 and finishing with cohesive No. 4. The pulp was nearly exposed. It was capped with carbolic acid and gutta-percha.

He also demonstrated his "soft-rubber blank," making a practical case of full upper plain teeth with pink gum.

By the use of this "blank," he saved the time and labor usually consumed in warming flasks, in cutting the rubber into small pieces and in packing. He also demonstrated his method of making a narrow plate with perfect adhesion from end to end by the use of his automatic suction cavity.

Dr. CHAS. G. PEASE, New York city, presented a partial crown with shoe, adjusted to the cuspid for the support of the adjoining lateral incisor.

A gold band was fitted upon the cuspid without grinding it at any point. It was fitted at the cervical margin as in an ordinary crown. The labial and palatal portions were then cut out up to the portion in contact with the tooth, on the palatal aspect, and anteriorly as high as necessary to leave a band of desired width at the cervical portion of the tooth, leaving the sides of the band in contact with the sides of the tooth. The edges of the band corresponding with the border of the flat surface of the tooth posteriorly were trimmed parallel with that surface. The band was then removed and soldered at one point to a piece of platinum rolled very thin, and cut to correspond with the flat portion of the tooth. The band being replaced, the platinum was burnished to the tooth to form the shoe in perfect adaptation to tooth.

A plaster impression was then taken of the palatal surface of the tooth with the band adjusted. Before filling the impression, the sides of the band and the platinum should be in close adjustment to impression. The band was then filled, removed from impression, and platinum soldered to the sides of the band, flowing solder all over the platinum. The band was then placed on the tooth and the porcelain lateral incisor, ground up, backed and placed in position in the mouth, being held in place by wax at the palatal portion. A plaster impression was then taken of the labial surface of the tooth and the band, filled, separated, and invested for soldering. In soldering, flow from the backing of the tooth to the palatal surface of the partial cap, and the bridge is completed.

Dr. F. P. HAMLET, Hempstead, N. Y., exhibited two cases of Brown's all-porcelain bridges. The first case, for Miss W., was the same presented before this society at a clinic June 11, 1889 (see COSMOS, vol. xxxi, page 699). Presented again, because it is one of the oldest all-porcelain bridges in use in the mouth, and to substantiate what has been claimed for the all-porcelain bridge. This bridge was inserted September 17, 1886; has been worn eight years and four months; has not been touched since, and showed the clean, healthful gum coming in contact with the porcelain. The bridge supports the crowns of two left superior bicuspids. It is supported in the mouth by a post in the root of the second left superior bicuspid, and a dovetail arm extending from the bridge is anchored in a gold filling in the anterior surface of the first superior molar. (A cut of this bridge is on page 267, Fig. 522, second edition of Evans's "Crown- and Bridge-Work.")

The second case, for Mrs. S., is the same style of bridge, but of a more recent and perfect system, having a saddle of pure platinum bearing upon the gum. An iridio-platinum bar extends from the bridge at each end, one of the bars being anchored into a gold filling in the right side of the right superior central, the other bar in a gold filling in the anterior surface of right superior bicuspid.

The bridge was inserted May 18, 1893, having been worn one year and eight months.

Mr. A. E. WOOLF, New York city, the discoverer of electrozone, gave an exhibition of its properties and action.

He described its manufacture, and enumerated its various properties, stating that electrozone contained hypochlorites of sodium, potassium, and magnesium, as well as hypobromites and other well-known antiseptics and disinfectants. Mr. Woolf drank it to show that it was non-poisonous, and then liberated the gases from it to show its potency. He took the ground that germs were more or less albuminous, and claimed as it would act on albumen (white of egg) so it would act on germs.

He then subjected the white of egg to the action of bichlorid of mercury, carbolic acid, and sulfurous acid, each of which coagulated the albumen. He then treated the albumen with electrozone, and a complete decomposition took place, the gas-bubbles arising till dissolution was completed in a few moments.

Dr. GEORGE BODEE, New York city, constructed a bridge-piece, crowning the right superior first molar, carrying two right superior bicuspids, making an open band for the right superior cuspid and carrying a right superior lateral. The work was all done on the model, beginning at 2 P.M., and at 4.30 P.M. having it all ready for final polishing, the object being to show rapid and thorough work.

Dr. W. C. DEANE, New York city, exhibited Powers's engine mallet made by Ash & Sons.

Dr. V. H. JACKSON, New York city, gave a demonstration of his system of correcting irregularities of the teeth, having present about one hundred and forty models of special cases with the appliances for their correction.

Dr. F. MESSERSCHMITT, New York city, gave an exhibition of bending wires, making partial clasps, carving the model, and doing the soldering for making appliances as described by Dr. Jackson in his system of correcting irregularities of the teeth. (See COSMOS, December, 1891.) The doctor made most of his demonstrations with German silver, calling attention to the advantage of using soft solder with a soldering iron, not allowing it to remain in contact with the parts longer than absolutely necessary, thereby retaining all the spring power of the wire.

Dr. W. E. WELLS, New York city, exhibited his new engine-mallet, of novel design, and demonstrated its use. He also presented his pellets for use in lieu of capsicum plasters.

Dr. JOHN KERR, Detroit, Mich., representing the Detroit Dental Manufacturing Company, exhibited their porcelain furnaces for crown- and bridge-work, and made and baked several crowns.

Dr. J. G. HOLLINGSWORTH, Kansas City, Mo., exhibited and explained his system of crown- and bridge-work, and demonstrated his method of contouring crowns.

Dr. J. P. HOLDER, New York city, demonstrated the uses of the Edison-Lelande battery and motor for dental purposes.

Dr. CHARLES A. MEEKER, Newark, N. J., bleached a left superior lateral incisor with twenty-five per cent. pyrozone. The tooth had a filling of amalgam, extending on the palatal surface from under the gum-line to near the incisive edge, requiring nearly an hour to remove, leaving a thin labial shell. The tooth was very black. The bleaching required forty-seven minutes. The method was as described in July COSMOS, 1894, proceedings Maryland dental meeting. During the past eighteen months in which Dr. Meeker has been using pyrozone for bleaching, he has had great success, the teeth so bleached remaining in good condition.

Dr. LEVI L. HOWELL, Riverhead, L. I., performed the following operation of "tipping." The right central incisor, inferior, was missing. He ground the incisors each side of the missing one on the articulating surfaces, down about the thirty-second of an inch, drilled two pits three-sixteenths of an inch down each side of the pulp, but not coming in contact with it, placed a piece of twenty-four carat gold on the surface of the teeth or tooth, ground and drilled, burnished the gold plate to fit the top of the tooth, then plunged a round piece of iridio-platinum wire (which would easily pass through a slot 21 gauge *standard*). On these caps was built up with eighteen-carat gold the space ground away. After building up, he placed them in position on the teeth, backed up a plain plate lower incisor, waxed it in position to the two tips, removed the three pieces, invested, soldered the dummy to the tips, then cemented the whole piece with oxyphosphate, making a complete bridge without destroying either pulp in the attaching teeth, and at the same time placing the whole strain in a direct line with the root of the tooth.

Dr. C. C. LINTON, New York city, treated and filled the root of a superior cuspid after the manner first suggested by Dr. A. J. Reinhold (see the *Independent Practitioner* for August, 1884). The pulp had been devitalized some weeks previous to the clinic by another operator, and Dr. Linton had never seen the tooth before. He found the pulp in a putrescent condition. After adjusting the dam and drying the root, he thoroughly cleansed it mechanically, after which he treated with C. P. carbolic acid, ninety-five per cent. After filling the root with the acid, he forced it up and through the root with pink gutta-percha, which he softened and pressed into the cavity.

After again thoroughly drying the root, he immediately *permanently* filled the root with the following mixture: Gutta-percha and iodoform in chloroform (the saturated solution of iodoform in excess), dissolved to the consistency of cream, and introduced upon shreds of bibulous paper.

Dr. Linton has practiced this method exclusively for upwards of five years, and claims very great success.

Exhibits of various specialties were made by The S. S. White Dental Mfg. Co., of New York city; Edison Electrical Co., of New York city; Johnson & Johnson, of New York city; Mrs. S. S. Hubbard, of Brooklyn, N. Y.; R. S. Williams, of New York city; Clinton Pharmaceutical Co., of Syracuse, N. Y.; Parke, Davis & Co., of New York city; McKesson & Robbins, of New York city; Edward Rowan, of New York city; T. O. Oliver, of New York city; Boston Dental Mfg. Co., of Boston, Mass.; International Dental Mfg. Co., of New York city.

About 4 o'clock P.M., as a fitting close to the day's work, Professor FANIEUL D. WEISSE, of New York city, delivered a brief lecture in the amphitheater on "The Symptoms which Enable a Differential Diagnosis of Tumors of the Buccal Cavity."

The paper of the evening was then read by A. W. HARLAN, M.D., D.D.S., of Chicago, Ill., entitled "Coagulants and Non-coagulants.*

Dr. Harlan made the following prefatory remarks:

Dr. HARLAN. Before reading my paper I would like to say that four methods of experimentation have been practiced by me with this subject,—the subject of the diffusion of coagulants and non-coagulants in teeth. The four methods may be epitomized by saying that the test is to introduce the agent into a tooth, freshly extracted, from whence the pulp has been removed. In some cases the apex of the root was not filled, in others it was sealed hermetically. No pressure of a liquid column was made, no force exerted to force the agent through the root. The agent was allowed to diffuse or not. In diffusing it could be found beyond the periphery of the root.

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* For Dr. Harlan's paper see page 169 of the current number.

The amount of the remedy used was about the same as would be introduced into a tooth in daily practice.

In the first place I have used egg-albumen, in the second serum-albumin, in the third plaster of Paris, and in the fourth paraffin. If I found by applying a chemical test that the egg-albumen contained the drug, or a trace of the drug, or that the serum-albumin contained the drug, or a trace of the drug, or that the plaster of Paris or paraffin was impregnated with it, that would be conclusive evidence that the drug had diffused itself through the dentine, cementum, and pericementum which had not been detached from the tooth. I did not wish to burden you with all the details of the experiments, and desired in the first instance to state that the methods of experimentation were as above.

I received substantial assistance in this work from Drs. B. D. Wikoff, L. N. Seymour, and Mr. W. B. Cory.

## *Discussion.*

President JACKSON. Before entering upon the discussion of this interesting paper, I would invite the president of the Second District Society to act as chairman.

Dr. F. C. Walker then took the chair and called on Dr. William Jarvie, of Brooklyn, to open the discussion.

Dr. JARVIE. I think it is unfortunate that I should be the first to be called upon to speak on this paper, because scientifically I know nothing about the subject. However, certain thoughts have come to my mind as I have listened to Dr. Harlan speak to-night in opposition to what Dr. Kirk read to us a year ago, and to what has been given to us by Dr. Truman since that time. As a layman who has made no experiments, but who bears in mind a little of what the three gentlemen (who are very earnest on the subject) have said, I am left in great doubt, as it must leave every other person who is situated as I am, as to what is the best agent to use to sterilize a pulpless tooth, or a tooth with a putrescent pulp. We are told by the essayist to-night that if we use any of the coagulants, zinc chlorid or carbolic acid, we will prevent the very thing we are endeavoring to accomplish ; that coagulation will take place at the mouths of the tubuli and render it impossible for the antiseptic to penetrate the coagulum into the tubuli, and so the putrescent matter that is already in the tubuli cannot be reached, and by osmosis this septic matter may reach the cementum and pericementum. If we use the essential oils we have not a coagulant, but we have not nearly as powerful or as rapidly penetrating antiseptics as we have with the coagulants. According to Dr. Miller and others, after corrosive sublimate, which we all admit is an unwise agent to use in the pulp-canals of the teeth, next in order of strength is the chlorid of zinc and carbolic acid. A year ago Dr. Kirk showed us experiments. He showed us the teeth in the tubes, which, if he was at all skillful and truthful, and I think he is both, showed us where the coagulating agents had passed through the coagulum and reached the farthest limits of the tubuli, and passed out through the cementum into the albumen in which the tooth had been immersed. We are told to-night that Dr. Kirk did not analyze that albumen ; that he only supposed from the appearance that the coagulants had passed into it.

I think that clinical evidence ought to have some weight in this matter. A large majority of the gentlemen in this room have not tried any of these experiments. We depend very largely upon the result of experiments of such men who devote time and energy and skill to making these tests,—men like Professor Harlan, who has been kind enough to come from Chicago, and Dr. Kirk, and Dr. Truman, and Professor Miller. We depend very largely upon what these men tell us, to guide us as to the agents we should use. After having used these agents, each one ought to depend very largely on the result of his own practical experience in the use of them. Now, if some of us have been successful in the treatment of teeth with putrescent pulps by the use of coagulants, we must think that coagulants are of some value. There are many gentlemen in this room who probably, at a certain point in the treatment of such teeth, hardly use anything else than such coagulants. The essential oils are used, but not to the extent that carbolic acid or chlorid of zinc are used. The gentlemen who use coagulants are successful. Whether they are as successful as the men who do not use them, but use the essential oils in their place, I am not prepared to say. I am guided somewhat by that in the remarks that I have made. This is certainly a case in which the doctors disagree, and yet the patient gets well sometimes by the use of exactly opposite agents.

Dr. J. MORGAN HOWE, of New York. I am not specially prepared to discuss the subject, but will raise the question why clinical experience is not considered of greater importance than it seems to be. Probably most of us have seen innocuous pulpless teeth remain in the mouth from five to twenty years without any root-filling whatever, notwithstanding the dentinal structure has been saturated with the putrescent contents of the pulp-canals. The presumption is that the apical foramen in all such cases is occluded. Cases in which irritation of the pericementum occurs have the apical foramen open. Perhaps a solution of the occluding substance has taken place, but, however that may be, we almost invariably find that the irritation which demands our interference has been effected in the tissue beyond the apex, in connection with an open foramen. It appears to me to be a reasonable conclusion that septic matter in the tubuli of the dentine does not cause irritation of the pericementum. In the next place, it seems to me to be settled by clinical experience that coagulating substances used to disinfect pulp-canals are effectual. Whether diffusion into the structure of the dentine takes place or not, such teeth are filled after disinfection, and are successful, almost invariably, in proportion as the root-canal has been well filled and at the proper time. Dr. Harlan says that he concluded from observation of teeth that had been treated and the roots filled, that the septic bacteria occupying the tubuli of the dentine had something to do with the irritation that caused these teeth to need further attention. That is as I understood him. It would seem to me that the need of attention more probably arose from imperfection in the root-filling. If the root-canal itself had been thoroughly disinfected, and even an approximately perfect filling had been inserted, the chances are greatly in favor of that tooth not causing further trouble.

I wish to emphasize the importance of clinical observation, and to suggest that experimental work that contradicts it is likely to be at fault. I appreciate the efforts that have been made *pro* and *con* on the subject of coagulants and non-coagulants, but I cannot believe that the mere question of the diffusion of these substances has such immense importance in regard to the cure and subsequent inhibition of pericementitis. I think we may come to change our methods in the process of accomplishing the object, but other agents will commend themselves for their therapeutical or chemical properties, whether coagulants or not. Without taking sides as to whether coagulants limit their own diffusion or not, I would affirm my conviction that coagulants have served us well in the past, and that no demonstrations in the laboratory can change that opinion.

Professor HEITZMANN, of New York. A microscopist is called upon to decide the question with his instruments. I am sorry to say beforehand that the verdict of the microscope is not in favor of the essayist. I know from observation with the microscope that when there is putrefaction in the pulp there is no doubt a possibility of the infectious materials, the ptomaines, the micro-organisms, being carried through the canaliculi and through the cementum to the pericementum ; but if you apply what the gentlemen call coagulants, which I know very well in their action, the pulp is destroyed. You besides destroy all the infectious material, and what becomes of the tenants of the canaliculi then? They are killed, because the source of life and nutrition—that is, the pulp with its blood-vessels and lymphatics—is removed. I had the pleasure of listening to the demonstrations of Dr. Kirk last year, in Brooklyn, and I can assure Dr. Harlan that the evidence given by Dr. Kirk was convincing as far as isolated teeth are concerned. Of course, if Dr. Harlan claims that the pericementum around the root may alter the experiment, it may be true. What I saw I take as a perfect evidence of the permeability of the canaliculi. Look at the canaliculi with a microscope, after the coagulant has been applied. They have kept their shape, but the tenants, the threads of living matter, are shrunken and dry. Do you suppose that this dry material within the canaliculi is a fit pabulum for the infectious material? No. The bacilli are gourmands ; they know what to feed upon. If you remove the living material by cutting off the supply, you lead to death all the micro-organisms that are present in the canaliculi. Dr. Harlan has a somewhat speculative turn of mind, I believe. His whole paper is a kind of self-defense against the remarks of Dr. Kirk. Dr. Harlan speaks of a coagulation of the basis-substance. That is impossible. If Dr. Harlan claims, as he does, that a coagulant will coagulate the matrix, the so-called basis-substance, which is glue-yielding, he is mistaken. There is not the slightest doubt that the glue plus lime-salts cannot be coagulated. It is perhaps the minimum of living matter, the presence of which Dr. Hart has demonstrated, that may coagulate, but that hardly counts. I cannot see what else can be coagulated by the application, except the pulp-tissue itself. I even doubt that the coagulant will ever enter a canaliculus. For so many years the dentists did not know what the tenants of the canaliculi were. The celebrated John Tomes suggested they might be nerves, which, of course, is not a tenable theory. It was myself who showed that they are fine filaments of living matter. So long as the tenants and their nature were unknown, we might have said that the coagulants could penetrate into the canaliculi ; but to-day, when we see the effect under the microscope, how they shrivel up, as Dr. Hart has shown with the chlorid-of-gold method, I do not think there is a chance for Dr. Harlan to imagine that the coagulant has penetrated into the canaliculi. We often come across specimens of filled teeth. I had the good luck to see specimens of fillings that Dr. Bödecker made, on a large scale, in a series of experiments with different materials. I can tell you that if you apply to the walls of the cavity carbolic acid, which every one, I believe, admits is a coagulant, you destroy the life of the dentine to a certain depth, and the rest of the dentine is kept alive. The teeth filled by Herbst plainly show this possibility ; but if you do it in a centrifugal way, if you kill the whole pulp, life is removed from the dentine throughout. If mischief arise, after a filling, in the sense of Dr. Harlan, it is not the material as such that is to be blamed, but it is a mistake in the filling. As Dr. Carr once remarked to me, "I sometimes take the utmost pains to have a root-canal filled, and nevertheless I get pericementitis and plenty of trouble ; sometimes a poor patient comes in, with whom I do not take such pains, and the tooth is perfectly comfortable and remains so for a number of years."

Dr. C. E. **Francis**, New York. I have listened with interest to the excellent paper of our esteemed friend from Chicago, and feel that we are all greatly indebted to him for having come so far to give us the result of his experiments and observations. I have greatly enjoyed listening, also, to our good friend Dr. Heitzmann, and also to the practical remarks of Drs. Jarvie and Howe, and feel that I have learned much from them. The subject under discussion has caused a considerable contention of late in various sections of the country, and there seem to be decided differences of opinion in regard to the theories advanced. I would hardly venture to express an opinion, and have it stand by the side of the statements of gentlemen who have given this matter careful study. Recently I received a letter from Professor Barrett, of Buffalo, which makes allusion to this subject, and I have copied extracts from it. If it be the pleasure of the gentlemen present, I will read them. Dr. Barrett also sent me an advance sheet of an editorial which was prepared for the *Dental Advertiser* for the present month on sensitive dentine, in which article he takes exceptions to the theory advanced by our essayist of this occasion. It might be out of place for me to read the editorial now, as it is on the subject of sensitive dentine, and has already been published, but so much of it as refers to the subject under discussion to-night I will give you :

"The dentinal fibril being of a protoplasmic albuminoid character, it must coagulate as the first step in its melting down. Of course, it cannot remain in a tubule permanently in its normal condition,—that is, with vitality,—and it must melt down. The very first and necessary step in this process is coagulation, so that it follows that coagulation is the very thing that should primarily be brought about. If it be not done artificially, it will be spontaneously, for albumen *must* coagulate as the very first step in the process of melting down. Hence I believe Dr. Harlan to be radically and positively wrong in his hypothesis, and that it is exactly the opposite of what he advocates that should be artifically induced. Coagulation of the contents of the dentinal tubuli should be induced, that the dentine may be made aseptic. The contents of the tubuli being removed, and the territory being made sterile, there is no chance for a septic condition, and the tissue is permanently conserved. The treatment then should be in case of the devitalization of a pulp :

"First, the devitalization.

"Second, coagulation of the dentinal fibrils.

"Third, an opportunity for them to melt down.

"Fourth, careful sterilization of the territory.

"Fifth, sealing up of the tubuli by the proper root-filling.

"Hence it will be observed that I place coagulation at the very outset of the process as a necessary step in the conservation of a root. If the pulp shall have been dead for some time, this coagulation will have taken place spontaneously. The dentinal fibrils will have been melted out of the tubuli, and it but remains to make the canal and the tissue aseptic. If it is already in a septic condition (I mean the canal, for I recognize the same septic state in the dentine that there is in the soft tissue), it must be reduced to a state of sterilization, and then filled. That, to my apprehension, is all that there is to it."

Dr. S. G. PERRY, New York. I can only speak on this subject from the clinical standpoint. I do not pretend to positive knowledge from the chemical standpoint. Many years ago, when, as some of the older members may remember, it was our habit to try occasionally to save pulps alive, by the use of chlorid of zinc placed directly in contact with the actually exposed pulp, many of us thought we had succeeded in saving the pulp alive, because afterward there was no disturbance, beyond the pain which lasted for a few days, and the teeth retained their color for a long time, so we flattered ourselves that we had saved the pulps alive. Many of us congratulated ourselves on having made a new departure ; but in course of time, we found, as we opened into those teeth, that the pulps were not alive at all. They were dead as door-nails, but they were in a peculiar condition. I do not know whether I ought to say they were shriveled up, because they were not exactly so. I might say they were coagulated. They were in a quiescent state. There was a clear point gained, and it is but one step further to reason from that to the point of considering each tubule in the tooth as being a minute pulp, and if the oxychlorid of zinc applied in that way to an exposed pulp would so act upon it as to put a quietus upon it, how naturally the next conclusion would be that if the pulp were removed, the same action would be had upon the tubuli. You will see how natural it was that the oxychlorid of zinc should be accepted as the best material for filling teeth, of course from a clinical standpoint, because at that time, and even now, none of us claimed to know much about it. I have come to the conclusion that, after all, the best material for the filling of the roots of teeth, whether the pulps had been recently destroyed and removed, or whether in cases of old, dead teeth, is oxychlorid of zinc in some form, and I do not think I have ever had as good results from any other material. I do not know what the action is, and I cannot say why I have had better results from it ; but it is a fact, and the thing for a dentist is to "get there," whether he does it from a theoretical standpoint or not. I had supposed, however, that chlorid of zinc was one of our best and most permanent germicides.

I recognize, however, the fact that as Dr. Harlan stated there are cases, and I am sure we all have had them, where in the use of oxychlorid of zinc in fluid form we have had that after-trouble which would seem to imply that it does penetrate, and have the irritating effect that he suggests. He claims that no irritation follows the use of the essential oils. So I have sometimes been staggered; but my safeguard or relief from that has been to use it conservatively and carefully, and to be extremely careful about pumping it through the end of the root, never being anxious to use it in too fluid a form.

I remember about ten or eleven years ago last spring, before the Odontological Society, I suggested that microbes at the roots of the teeth were causing most of the trouble that comes from dead teeth. A broad grin went around, like a poor man's lease, from year to year. I said that the contents of the dentinal tubuli were excellent pabulum for those microbes, and might be compared to a spring chicken, a little stale and somewhat tainted, which, being inadvertently eaten, might give one an active diarrhea the next morning, and which no one then would have supposed was caused by microbes, but which every one to-day knows is caused by nothing else. Don't you think, gentlemen, I have a little satisfaction in knowing that what I was laughed at for then is being recognized as truth to-day?

Dr. M. L. RHEIN. It would seem to me as though the agitation of this subject, as we have listened to it for the past few years, should bring some great material benefit to us in our practical work in this direction, and I believe it will in the future. Up to the present time I do not think we have acquired, as a whole, any practical gain from this subject, but it is bound in the end to bring about a clearer understanding of our methods of procedure in the roots of teeth as soon as we are sure we have reached the truth of this matter. It is the one place in which the dentist works in the dark; that is to say, when he is inside of the canal of a root he has gotten beyond the point where everything is absolutely open to his eye. To this fact are due many of the errors and mistakes in treating root-canals. To my mind the agitation that has been started between Dr. Harlan and Dr. Kirk would not amount to much if we could get them both together. The unfortunate thing is that they always appear separately, and the other man is always absent. I have had the pleasure of discussing this question with each of these men at some length, and, astounding as it may seem, can see very little difference in their views. While the titles of their respective papers are antagonistic to each other, I have come to the conclusion their differences on the chinical aspect of the question are but slight, and that is what interests us. As far as there is any difference at all, the difference seems to be as much in favor of one as in favor of the other. That seems to be somewhat of a paradox, but you are all on the fence on this question. Many of you this evening incline to Dr. Kirk's side of the case, and yet you do not jump over with the vehemence that is characteristic of a cause worth fighting over. To start with, they differ as to what are called coagulants. They do not agree as to all so-called coagulants. In my own mind, I think we must distinguish between the action of different coagulants. All of them do not work in the same way. That chlorid of zinc has clinically demonstrated the fact that it will preserve the pulps of teeth for years we all know, and yet many of us are aware that creasoted pulps will not be preserved in the same way. Why is there any such difference between different coagulants working in the same way? If it is merely a question of coagulation, then they ought to work the same whether they are coagulated by carbolic acid, bichlorid of mercury, or creasote; but, judging from a clinical standpoint, they certainly do not act in the same way. I think coagulation of pulp-tissue is not the vaunted remedy for the preserving of devitalized teeth for which this claim is so often made. On the contrary, I cannot see anything in its use but the leaving of a condition of affairs that is liable, however late it may be, to be the starting point for future trouble, and in this one matter I cannot help but agree with Dr. Harlan in his paper. Even if you preserve a tooth for twenty years in this way, if a breaking down of the health of a patient occurs in such a way that he is subjected to some enervating disease, where his vitality is not in a condition to resist the inroads of disease, that tooth will, if it has coagulated pulp-substance within it, be a favorable place for the invasion of septicemia. As to the question whether volatile oils will not diffuse through coagulated tooth-structure, or tooth-structure that has been treated by coagulants, in that respect my clinical experience does not agree with the author of the paper. The reason I have for making this assertion is that the method of procedure which I have for treating canals consisting, after my canal has been thoroughly cleaned,—and, by the way, I do not care what method is pursued, or what side is taken, I claim that if the canals of a tooth are thoroughly cleansed, it makes no difference then what side of the fence you are on on this question,—having cleansed a canal thoroughly, my next step is to thoroughly sterilize it by a so-called coagulant. I consider the best germicide for the purpose to be bichlorid of mercury in a solution of peroxid of hydrogen. Having done that, and dried out my cavity, in order to prevent any possible irritation around the periphery of the root, I then hermetically seal in that cavity a silk thread impregnated strongly with oil of cinnamon, and it has been, in the majority of cases, my clinical experience that my patients will come to me afterward, not within a year or two ot the sitting, but perhaps on the following day, and say, "There must be something wrong with that dressing, because I taste cinnamon oil all the time." Clinically I cannot account for the taste of cinnamon oil in any other way than as a diffusion of the cinnamon oil through the root, which is exactly the reason that I inserted it for, and consequently my views do not coincide on that point with the essayist's remarks.

The only other point I wanted to mention was the one that Dr. Howe spoke about. I would like to call attention to it, because I question whether he did not make a statement which he hardly meant. He spoke about putrescent pulps remaining in teeth, the ends of which were occluded for years without giving trouble. Did you mean putrescent pulps, Dr. Howe?

Dr. HOWE. I meant devitalized pulps.

Dr. RHEIN. I could hardly understand a pulp which is in a state of putrescence remaining in a quiet state for such a length of time without any vent for the gas that would be formed.

Dr. O. E. HILL, Brooklyn. The great fault with all scientific men, and men who talk on scientific subjects, is, as I understand it, that what is called science to-day is the utmost nonsense to-morrow. Time, clinical observation, clinical experience, must prove whether what these gentlemen say is true or false. I wish to relate a little incident. This very day I crowned a lateral incisor, the root-canal of which I filled twenty-one years ago with gold. In removing the root-filling to enlarge the canal, there was the odor of creasote just as pure as when I put it in. That creasote must have penetrated the tooth. Many of you have had similar experience. That is why I do not care about your coagulants or what they will do. That same patient has no less than six teeth in his mouth that were filled previous to 1881. They are all single-rooted teeth, except one bicuspid, which is probably not. I took particular pains to examine my books, so what I say here to-night is true. Dr. Kirk was, to my mind, very conclusive. About Dr. Harlan I do not exactly know what to say. Of course, he is thoroughly honest ; there is no question about that. He believes just exactly what he says. Dr. Kirk believes precisely what he says, and my friend Rhein says we are all on the fence. We are not. We are between those two men, and we are doing and practicing what our experience has taught us to practice. They are each trying to prove different things. In the mean time we will go right on with what we have been doing for the past thirty or forty years, and done successfully. We do not all want to be chemists, because if we were we would not be good dentists, for chemistry is a specialty.

Dr. J. W. WASSALL, Chicago. I have not much to say on the subject, but, as Chicago seems to be getting the worst of it, I think it is charitable of the president to give Dr. Harlan's fellow-citizen a chance to help him out. In the treatment of pulpless teeth, there are two classes to be considered,—teeth in which we have devitalized the pulp, and teeth in which we find pulps already putrescent. I take it that teeth with putrescent pulps are the only ones that are properly under discussion to-night, although the others have been mentioned. In these cases, we have a zone of septic dentine between the living cementum and the pulp-chamber. Of course, the pulp-chamber can be easily cleansed of its putrescent contents. This zone of dentine is the part of the tooth to be sterilized, to put the tooth into a healthy condition,—that is, in a condition where it will give no trouble in all the years to follow. It stands to reason that any drug introduced into a pulp-chamber which will prevent the penetration of the sterilizing agent into the dentinal tubules, will prevent us getting an aseptic condition of the tooth, and I think that Dr. Harlan's experiments, and the definition of the term coagulant, prove to us that we should use no coagulants in the treatment of teeth containing putrescent matter. We should use only the agents that will most easily penetrate into the tubules of the dentine.

Dr. J. MORGAN HOWE. For about a year and a half I have used electrozone for sterilizing pulp-canals, and more recently I have used it in the treatment of pyorrhea, with very good success. I believe that electrozone is not a coagulant, but I have been indifferent to that question. I have found that electrozone does not produce irritation at the so-called apical space, but tends decidedly to reduce inflammatory processes. It is very effective as a disinfectant, and these qualities have induced me to continue its use. I have treated many teeth from the beginning to the end with no other medicament than this, and have filled them without any subsequent cause for regret thus far. Dr. Rhein's reference to the different qualities of agents that we use is important. There are medicinal qualities in many of the agents that we have used that have not been sufficiently recognized. These have received too little attention, the tendency being to regard and speak of them in classes as coagulants, antiseptics, and so on, without regarding the therapeutic action which each agent has peculiar to itself. In regard to putrescent pulps, when Dr. Rhein asked me I did not quite understand the gist of his question. I did mean putrescent pulps.

Dr. J. F. P. Hodson, New York. I just rise to say two things. One is that about twenty years ago I suggested before the Odontological Society, and very urgently, that carbolic acid should not be used in devitalized teeth. I was urging its employment in all cavities in live teeth, in that its coagulation of the contents of the dentinal tubuli for a tiny distance would produce a non-conducting "head" to each fibril, and thus a perfect non-conducting lining to the cavity, to prevent shocks from thermal changes through the filling, without using up the cavity depth with more tangible non-conducting materials. But for the same reason (the coagulation of albumen) I deprecated its use in devitalized teeth, as I felt that the fixing of the fibrillæ into coagulum produced the very plugs in the microscopic orifices of the tubuli which, though so peculiarly valuable in the live teeth, would here, on the contrary, make it substantially impossible for me to ever thereafter reach the more discolored portions beyond, to remove the offensive color, which always seems to me to be about as hurting a stain upon the reputation of the operator as upon the tooth, consequently I turned to other methods of disinfection and treatment, but in the employment of those things which Dr. Harlan has, of late years, suggested, mainly the essential oils, I found much discoloration to ensue,—I supposed from their oxidation,—and so discontinued their use. Will he kindly tell me wherein I used them wrong, as it is evident he has solved this difficulty?

I do not quite agree with the majority of the speakers to-night in respect of their believing so strongly and so exclusively in the value of practical experience. Undoubtedly it is good, undoubtedly it is the proving; but if we are to depend wholly and only upon clinical experience and not at all upon theoretical study, why that is what the charlatans do. Surely theory and practice should go hand in hand. One should prove the other.

Dr. Levi L. Howell, Riverhead, L. I. I believe it was three years ago that Dr. Harlan was here. I am surprised to hear so many gentlemen say after that beautiful clinic that they know nothing about this subject. I went to see Dr. Harlan about it, and tried to get all the information I could. I can give you a record of four hundred teeth with putrescent pulps treated by his method, and you cannot find five per cent. of failures in those four hundred. I went home imbued with what he said. Two of my students are here to-night, and they will tell you that they have never seen a coagulant on my operating-table for the treatment of such a tooth. I went into one of your colleges the other day. The students were operating. No less than four had a case there, trying to treat it. I showed one of the students the treatment of Dr. Harlan. They had been using the coagulants, and yet non-coagulants saved that tooth, and that was in the dental college of this city. When this essayist comes to you and gives this beautiful demonstration, and men tell him they know nothing about these things, or not enough to discuss them, I do not think they are sufficiently informed to criticise his paper.

Dr. F. Milton Smith. The suggestion was made that clinical experience should not count. If I mistake not, our friend Dr. Harlan, almost in the first of his paper, referred to his clinical experience, and it seemed one reason why he discarded the coagulant treatment. I understood him to say that where he was treating with coagulants he found they gave trouble. It seems to me this is a broad statement. Dr. Rhein has also made the same statement. I would like to ask Dr. Harlan, in case of treatment either with coagulants or non-coagulants, taking for instance one hundred cases, how many out of that hundred should prove perfectly comfortable at the end of a year, in order to prove that either coagulation or non-coagulation was the successful treatment? My thought is that in order to say that a certain method of treatment is not successful, we must consider more than one or two or ten cases. Dr. Howell has stated that he has a clinical record of four hundred cases with non-coagulants. I can give you a record of more than five hundred successful cases with coagulants. What does this prove? I can bring to you a gentleman who for ten years has exclusively used coagulants, and I believe he has succeeded in nine hundred and ninety-nine cases out of a thousand. It proves this, and nothing else,—that it is not the question of coagulants or non-coagulants in the treatment of teeth. Dr. Perry has stated that in his experience the oxychlorid of zinc was the best material to use, and he also recommended chlorid of zinc. Five years ago I read a paper before the Second District Society describing a plan of treatment which was brought to my attention by Dr. A. J. Reinhold: after thoroughly cleansing, treating with either pure carbolic acid or chlorid of zinc, a twenty per cent. solution, and only treating once in case of a putrescent pulp, thoroughly filling that root with a solution of gutta-percha and iodoform dissolved in chloroform. I can give you, out of my practice, more than five hundred successful cases. I believe that this goes a great way toward establishing the fact that it is not a question of coagulants or non-coagulants. I have never heard that Dr. Shields puts coagulants in teeth. He says he fills them with gold clear up to the top. I believe he does it. I cannot do it. It seems to me that this matter of coagulants or non-coagulants is not as important as the essayist would have us believe, but the great thing is, after all, thorough work.

Dr. Rhein. I stated directly the opposite of what Dr. Smith said. I stated that both methods, the use of coagulants and the use of non-coagulants, as exemplified by Dr. Harlan, were successful. I took the same ground as the speaker, and not the ground that I found the use of coagulants gave bad results. I tried to make it clear that I believed the success lay in the thorough cleansing of the canals. Do this, and either method will lead to success. Fail in this, and abscesses will always be a probable sequence.

Dr. HARLAN. I believe I have been the most entertained person present. The question of the hour, to which I came to reply, was, "Do coagulating agents prevent their own diffusion through tooth-structure?" I thought I had answered that question. I did not enter into the question of the relative values of coagulating agents and non-coagulating agents in the treatment of pulpless teeth, except in the conclusions. I did not give any reasons for the use of non-coagulating agents in my paper.

Summing up the discussion,—

Dr. Jarvie says that doctors disagree. That I am willing to admit.

Dr. Howe says that clinical experience is the arbiter of everything. If you are successful when the canal has been filled, diffusion is of no importance.

Dr. Heitzmann says, "I doubt very much if a coagulant can enter a canaliculus," and I am quite willing to subscribe to that. Does not that prove my position? There is nothing plainer than that. We have one of the best microscopists in the world right here to sustain me in his own words.

Dr. Francis quotes Dr. Barrett, who is not an all-around histologist. He says that coagulable material must be melted down. That is the ultimate outcome of his statement. If it is melted down, it prevents the coagulator from passing through. Air is the best coagulant that nature produces. There is no coagulator that is better than air when it comes in contact with blood that is pouring from an artery or a vein.

Dr. Perry's remarks are extremely good. He did not discuss the question in my paper, but what he did discuss was correlative to it, and hence not only passes, but has a high mark.

Dr. Rhein says if Dr. Kirk and Dr. Harlan got together, everything would be all right. It is all right anyhow. The only difference is, that I have studied this question for more than fifteen years, and Dr. Kirk studied it for a few months before he read his paper. He wanted to prove that coagulating agents did not prevent their own diffusion through dentine and cementum, and he did not prove it; that is, in the experiments you saw made you think they had passed through, but he did not exhibit any specimens with carbolic acid, which is the sheet-anchor of the average practitioner throughout the United States and the world. If he does not use carbolic acid, he uses creasote; and when it stays in a tooth twenty-one years, as cited by Dr. Hill, and exhibits its odor at the end of that time, it shows that it had not passed through.

Dr. JARVIE. I want to ask Dr. Harlan a question here, for fear I misunderstood him. From your remarks, I understood that the question that Dr. Kirk took up as to the diffusion of the coagulants through a coagulum was an inconsequential question. I thought that was really the question of all questions involved between you.

Dr. **Harlan.** It is inconsequential, because the use of coagulating agents was not defined. His experiments with reference to membranes through which coagulating agents passed had no relevancy to this question whatever. His discussion of the doctrine of osmosis did not cut any figure at all. It was merely incidental, and led up to the main question. The only question was, "Do coagulating antiseptics prevent their own diffusion?" and he says they do not.

Dr. **Jarvie.** And you believe they do?

Dr. **Harlan.** Yes, and I can prove it.

Dr. Howe says he has been using for a year and a half electrozone, which is a non-coagulator, and he recommends every one to use it. If he does this, it must be because it is better than carbolic acid or chlorid of zinc. It must have some merit.

Dr. Wassall introduced a question which I did not mention in my paper, but upon which, if you will permit me a moment, I will elaborate. When the pulp of a tooth is destroyed intentionally, by the use of orange-wood dipped in carbolic acid, or anything else, or by the use of arsenious acid, it is the evident intention of the operator to remove that before putrescence takes place. After he does so, and he has no putrescible matter in the tooth, and he treats that tooth with a coagulating antiseptic, there is no objection to that, because there has been no absorption, infiltration, imbibition, penetration, or permeation of any cadaveric alkaloid, micro-organism, ptomaines, or any of the spores of pathogenic micro-organisms, and if he fills the apex of the root that coagulum will not be broken down. I will repeat that if you wish; in other words, I say, if you destroy the pulp of a tooth in any way intentionally, and do not allow the pulp or the pulp-canal to become contaminated from external sources in any way, and you remove the pulp and dry it, and introduce a coagulating agent, and fill the root, there is no objection to that, because no anaërobic micro-organism can gain entrance to that unless there is destruction of the peridental membrane or cementum, or tearing down of the dentine, and getting it into the pulp-canal in that way. I am perfectly familiar with conditions of that kind, although I never studied in Dr. Heitzmann's laboratory. (I have great reason to be thankful to him for sustaining me to-night, unconsciously though he did it.) If the pulp of a tooth becomes destroyed by accident or design, and is left to be contaminated, and it is decomposed, and gases of decomposition come out of the opening in the tooth or pass through the apical foramen, and we have a blind abscess or an acute abscess, and afterward the dentist wishes to treat that, and does treat it, and he applies the rubber-dam and washes it out and cleans it, and gets rid of everything that he can in a short time, fifteen or twenty minutes or perhaps an hour, then introduces chlorid of zinc, or carbolic acid, or bichlorid of mercury, and immediately fills the root, in six or eight years afterward, or perhaps in three months or less, that patient has trouble, because he has sealed within the open ends of the dentine tubes exposed toward the root-canals various poisons, the nature of which he does not know, because he has not sterilized them. If he does not use a sterilizing agent which will pass through and neutralize and destroy and alter and change these poisons, or prevent the future growth of the spores of the pathogenic micro-organisms which may be there, then he would leave that tooth in a bad condition.

This is a general classification, but I have allowed you all to talk so long that I want a minute or two to make myself understood. That is the class of teeth in which I object to the use of coagulating agents. Chlorid of zinc is an incinerator, a burner-up of albuminous matter. It will destroy silk or cotton. Nobody needs to know more than the primer of chemistry to know that. Carbolic acid is generally used at ninety-five per cent. or thereabouts. The formula of serum-albumin I will not burden you with, because you can easily work it out yourself. There is a chemical change when carbolic acid comes in contact with albumin; there is a chemical change when corrosive sublimate comes in contact with albumin; but there is not a chemical change when chlorid of zinc comes in contact with it. It has a great avidity for water, and as soon as that avidity is satisfied it goes no further. It does not pass into the tissues at all.

Dr. Perry. In a pulpless tooth, is there any albumen at the opening of the tubuli, which you would liken to the albumen of an egg? Is there anything to be considered at that place and anything to be used at that time beyond something to kill the germs? Is it possible to reason so closely and so finely as to say you are actually coagulating albumen in a tooth which has been dead for years? This is merely a question, and not intended as an argument.

Dr. Harlan. When the pulp of a tooth dies of its own accord by accident, or through regulating teeth, or through anything like that, and we do not have an abscess at the apex, either blind or fistulous, the end of the root of that tooth becomes encysted. There is a growth that takes place there, numerous instances of which I suppose our friend Dr. Heitzmann has seen. When you open into a tooth of that kind, you find the pulp is shriveled up, although no coagulating agent has ever come in contact with it. You find it without odor. That kind of a tooth does not have any albuminous matter between the cementum and the pulp-canal that can be coagulated, because that is more nearly analogous to mummification than anything else, and that mummification cannot be produced with chlorid of zinc. If you open into a tooth of that kind, and find the canals moist, then you have albuminous matter that may be coagulated in the dentine of the tooth. In all probability there is more water in the dentine of such a tooth than would be found there normally; but at a little greater depth, the contents of the tubes, or the canaliculi, are not disorganized, and this water is capable of being coagulated, if an agent is applied which will take up water. If the coagulating agent at that time is applied before any attempt at sterilization or disinfection is undertaken, you may find that still beyond that point of coagulation there is poisonous matter within the dentine that would, if left there, ultimately cause a breaking down of the peridental membrane, and that would account for a great many of the lame teeth that are treated so superficially and so generally, as practiced by the so-called immediate root-filling method. Of course, this question that you have asked me is not really relating to my paper, but I make this explanation at this time simply to indicate what my position is in this matter.

Dr. Hodson says he recommended more than twenty years ago that carbolic acid should not be introduced into pulpless teeth, because it prevented their easy bleaching, in which position he is entirely correct; because the bleaching agent will not pass through the coagulum that is produced in the mouths of the tubes. Dr. Heitzmann smiles, but that is where Dr. Heitzmann takes a back seat. This is a practical subject; that is why I say that, no disrespect being intended to Dr. Heitzmann.

Dr. Hodson wants to know why the essential oils discolor. Some of them do not. Oil of cassia has a coloring matter which will permeate a tooth from one end of it to the other, up to the enamel and through the cementum. It will pass out through the cementum. In more than seven hundred teeth that were planted in plaster of Paris and other substances, we found that oil of cinnamon and oil of cassia could be recovered from the plaster of Paris in from twelve hours to three months, showing that it passed entirely through the tooth and went into the plaster of Paris. When the plaster of Paris was ground up and water added, we would find that the oil could be detected by chemical test in the water. The oil of myrtle and the oil of thyme will not discolor a tooth, and there are a number of others. Old oil of turpentine would eventually discolor a tooth.

Dr. Howell spoke of the exhibition that I gave before the First District Society in 1889. That was the first demonstration of the use of coagulating agents that was ever made before any dental society in the world. I simply demonstrated that certain agents would coagulate albumin, and certain others would not. My opinion was at that time that the non-coagulants were the best.

Dr. Smith asks a question about what are the comparative results with different methods of treatment. I have never taken a single hundred of teeth that had been treated one way, and a single hundred of the other kind, but from 1869 to 1881 I used coagulants in the treatment of pulpless teeth; I have always lived in one city, and have seen the results of my treatment and that of other gentlemen, and I determined that it was not the best practice to use coagulants.

I have used non-coagulating agents longer than I have used coagulating agents. I think it is a doubtful question whether the user of coagulating agents succeeds in closing many of the fine canals. He often succeeds in preventing the complete filling of the root-canal, and afterward there will be a permanent lameness of the tooth, or a small abscess if it is a three-rooted tooth, from the one having the most minute opening, and that will account for many obscure neuralgias or uncomfortable feelings on one side of the face that many patients are treated for by their physicians. If they fall into the hands of a dentist who is unfriendly, he will discover that one portion of the root is unfilled, and that is probably the one that was treated with the coagulant. It could not happen with a non-coagulant. It does not solidify. If there is a portion of the pulp of the tooth remaining there, it would produce the abscess just the same in all probability, because that kind of material would be susceptible of disorganization through the agency of micro-organisms, the same as anything else.

Dr. Watkins. I would like to ask if you have made experiments with electrozone as a coagulant or non-coagulant; and in asking that

I would like to state that Mr. Woolf, the discoverer of electrozone, made experiments with it, and he showed to us quite conclusively and satisfactorily that electrozone was not a coagulant ; that it destroyed the albumen, cut it all up, so that it had the appearance of water, where carbolic acid, sulfuric acid, and bichlorid of mercury coagulated very readily. In the same experiment he exhibited those different materials, and applied them to water which had an aniline matter in. In each case he applied fully half an ounce, or perhaps an ounce, of these three remedies, carbolic acid, sulfuric acid, and bichlorid of mercury, and they would not destroy the aniline matter. He applied one drop of the electrozone, and it destroyed the aniline matter in the course of two or three minutes, so that it had the appearance of being clean water. He stated that there were two kinds of electrozone, one medicinal, which he had prepared for dental use, and the other for general disinfecting purposes.

Dr. Harlan. The only answer I can give is, that the electrozone that I have used is a non-coagulator of albumen. The process of manufacture of electrozone would tend to show that it was not a coagulator. It was not intended to be, and if it gains any reputation in dentistry it must gain it on the fact that it does not coagulate albumen. I thank you sincerely for your patience and courtesy this evening.

Dr. Starr. I move that a vote of thanks be extended to Dr. Harlan by these two societies for his coming so great a distance to give us such a valuable paper.

Carried unanimously.

Dr. Starr. I would also move a vote of thanks to the faculty of the New York Dental College for their kindness in allowing us to hold our clinics there, and extending us so many courtesies.

Carried.

## NEW JERSEY STATE DENTAL SOCIETY.

(Continued from page 120.)

### *Discussion on Dr. Faught's Paper* (continued).*

Dr. Elliot. The question arises, How far does it come within the province of the dentist to practice in this direction? That idea came to me particularly when listening to the paper which was read this morning by Dr. Cryer. We have in this state both a medical and a dental law, by which we are governed and our practice controlled. Now, in the last prospectus of the Philadelphia Dental College it is particularly noticed there that it is generally understood that the practice of oral surgery as a specialty is, probably, without the realm of the dental profession, and that they have really no right to practice in this field unless they have attained the degree of M.D., and therefore become qualified in that direction. It seems to me there was a good line of demarkation between medical and dental practice in this respect; yet if I prescribe medicine in a general way for patients, it excites the jealousy of the medical profession, and the question is, How far can we go, and what is the limit of our duties to our patients in that direction? It is a question that I have thought a great deal about, and it has been thrown up to me.

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* "The Possibilities of Systemic Treatment of Dental Diseases." See Dental Cosmos for December, 1894, page 969.

I having been honored with the degree of M.D., I have enlarged my practice further than is usual among dentists, and I have been taken to task in certain directions for having practiced medicine without a license to practice medicine under the medical law. Now, in the prospectus that I have referred to, of the Philadelphia Dental College, it is required, I believe, that a student shall attain the degree of M.D. in order that he may practice oral surgery in a legitimate manner; and also the law of this state is such to-day that the dentist is excluded from medical lines, except so far as his legitimate practice may tend to it. Now, what is the limit of legitimate practice? That question has come up to confront us, and it will have to be decided.

Dr. WILLIAM H. TRUEMAN. I think Dr. Flagg during his remarks, possibly unwittingly, perhaps intentionally, gave us a very good illustration of how quickly a well-informed dentist reaches the danger line when approaching systemic treatment. When speaking upon purely dental subjects, when speaking of dental remedies, he was perfectly at home; as soon, however, as he passed beyond that and began to speak of systemic remedies he was at once "out of his bailiwick." He had to stop and think, and only with an effort could he recall their names, and yet I have no doubt he is as well posted upon materia medica as any dentist present.

Many years ago, when oral surgery first came on the boards, I expressed the opinion that in the attempt to grasp too much we were likely to become, as the old adage has it, "jacks of all trades and masters of none." I still think so. I am impressed that the gray matter of an ordinary human brain don't amount to much when spread out so thin.

It is all very well to say that there is no need of alarm; but if you employ remedies with which you are not thoroughly conversant, you may soon place yourselves and your patients in a very critical position. It is not enough to know that a remedy has usually a certain action or effect; we want to know whether it may not also produce some very undesirable result, and who can tell that but one who is constantly prescribing such remedies, to all kinds of people and under varying conditions, and continually watching their effects? We might just as well expect a physician who has given no attention to dentistry to take up and intelligently treat alveolar abscess. I don't know what your observation has been, but mine has been that in every case where an alveolar abscess has fallen into the hands of a regular physician, it has been to the patient's cost. I think there is a border line beyond which it is not best for us to go. Let me recall to your minds the fact that, years ago, when this subject was brought up in another phase, when it was recognized that simple mechanical treatment did not preserve the teeth as we desired to preserve them, and it was said that we must diet our patients, phosphates were prescribed, and special diet was prescribed. Now, how do we stand on that question to-day? Dr. Faught told us, in a recent article, that this dieting had not amounted to a row of pins; not in these words, but that was the sum total of it, and he voiced, I think, the experience and conclusions of those who have watched it most closely. In my own practice I have little use for medicinal treatment, and I advise my brother dentists to let it severely alone. If medicine is needed, you can send the patient to his physician. I do that, and I advise others to do the same.

Dr. HAYHURST. I am fully in accord with the expressions made in the paper all the way through, so far as I can understand it, but I think there is one thing in it that will prevent it from being universally adopted, at least in this present generation. I ask now, in all sincerity, how many of us here to-day are capable of administering medicines in the systemic treatment of matters that pertain to dentistry, how many are willing to undertake a treatment of that kind which may possibly come under the hands of the dentist? There are medicines mentioned there that would be very dangerous in unskilled hands. To administer those medicines requires an education and a judgment which most of us have not attained, and it would be folly for us to undertake it. There is scarcely a college faculty formed in the United States, possibly in the world, in which there are not one or two men whose business is to give instruction in systemic treatment. I at one time found fault with the colleges because they did not form their faculties entirely from the dental profession; but when you look to this matter of systemic treatment, you must acknowledge that medically educated men are more fully equipped to give that instruction than others are.

The idea of the paper, as I understand it, is that dentists should give such systemic treatment, should extend their practice into medicine only so far as relates to dental matters; and I think that it is in this direction that we may move onward. I know there is a great tendency now to separate even medical science into specialties, and we know that there is the same tendency to divide up into specialties in other professions; but under the present system, and in the present generation, there are very few of us who are capable of undertaking to carry the profession up to the mark that has been indicated by this paper.

Dr. NILES. We all have to admit, the medical profession will have to admit, that the dentist deals with facts; he knows that a certain line of treatment, if well proceeded upon, will produce certain results. We know that, all things being equal, a dead tooth, thoroughly treated, disinfected, and filled, will last a good length of time; we know that filling is a positive treatment, and the treatment we give is generally positive, whereas if you turn to the medical profession you find their treatment is theoretical. Medicines are given less and less every year, and as you look over the field of medicine you know how many different treatments which are said to produce certain results have come into the field. So if we dentists are to turn to the practice of medicine, I think we should be thrown into confusion. I congratulate myself and my friends that in the practice of dentistry I have the assurance of positive results from certain lines of treatment; but if we branch off into medicine it would throw us into theory, and I don't know but it would break up the practice of dentistry.

Dr. FAUGHT. Mr. President, in concluding this discussion I simply want to call attention to one thing that I was very careful to say in my paper, that our practice in this line was to be limited, and was to grow as we found the need of remedies. If we plunge into the broad realm of the practice of medicine, we will plunge into destruction ; but for a man to stand, as I have personally stood in my office before a patient, with mortification, where everything had been done that could be done by manipulative skill, and yet have to confess that I could not give the slightest relief to my patient,—it is a very sad place to stand in. If we could solve that problem, or reduce its difficulty ever so little, it would be worth the effort. Beginning with one medicament or line of treatment, then adding another, and being sure to thoroughly understand what we are doing, we should be able to meet the emergencies that are liable to occur, within certain lines in our practice.

With regard to the remark made by Dr. Trueman, that I had written a paper in which I had called attention to the fact that after all these years of special dieting it did not amount to a row of pins, he told you the truth : he stated exactly what I said, that we have found out that we may fill the patient full of phosphates and such things, but until we can bring about assimilation of food in the system we will not restore the materials it lacks. He said we have failed in our efforts in that direction, and that is true ; but now we come to the next step. We want to use these remedies so as to bring the system into such a condition that there will be better assimilation, and we will have a better ground to work upon.

The safety line lies neither in the practice of dentistry nor in the practice of medicine ; it lies every time in the knowledge which you have yourself. There is no safety in a diploma if you make mistakes or errors ; your safety lies in your knowing your subjects and not making those errors. You are only held responsible for the exercise of due care in the practice of your profession. Dentists are just as capable men as the members of any other profession, and if we follow our profession with a determination to reach the point I have indicated, I see no reason why we cannot reach it, nor do I see any reason why we should not try to do so. Then, remembering that the line of demarkation, and the line of protection, lies in your own personality, go to work and get the knowledge, and acquire the ability to take care of yourselves in the use of those remedies.

Reference has been made to the envious eye of the physician and his jealousy. I have not found it so. There is not the slightest jealousy over the matter of prescribing medicines for dental diseases ; on the contrary, those cases of irritation resulting from dental troubles they are very willing and glad to place in other hands. They recognize the fact that they know little or nothing of these troubles in their relationship to dentistry, and they are glad to say to the patient, "Go to your dentist." The best men in the medical profession will take you by the hand and help you in diagnosing the case and in suggesting remedies. Instead of jealousy, I have reason to thank the members of the medical profession for helping me out in these matters.

The next paper was upon "Ethics," by Dr. J. FREEMAN BURKET, of Kingman, Kansas. It was read by Dr. G. Carleton Brown, Dr. Burket not being present.

Following is an abstract of the paper:

## ETHICS.

A widely accepted opinion obtains among scholars of to-day that "the present man is a being that can be understood only through a knowledge of his past history." According to this theory, to understand man in his present ethical relations it is necessary to know historically the development of ethical thought.

Modern ethics is drawn from European ethical thought, which, in turn, comes from the Greek. Greek ethical speculative thought may be traced to where it is but dimly discerned in the utterance of wise precepts for conduct, in the literature of the sixth century before Christ.

What might be termed a vague semblance of a system of ethics may be found in the fragmentary treatise of Democritus, a contemporary of Socrates in the fifth century B.C. This shows that the pre-Socratic thinkers had brought philosophical thought to a Socratic atmosphere. The times were ripe for the change, and the genius of Socrates appeared to perfect it. In him we first find philosophy clearly concerning itself with human conduct, and so forming that spring whence flowed onward the current of Greek ethical thought.

But up to this time the term ethics had not been applied to this new branch of philosophy. It was first given to a treatise of Aristotle in the following century. The word ethics admits of no clear, comprehensive definition, as it is subject to change in its application, according to the development of thought. Even this first treatise to which it was applied broadened beyond the original meaning of the word, "that which relates to character," and embraced the good and bad qualities of character.

Greek ethics aimed at the perfection of the individual, not the good of society or the state. This perfection was to be attained through the individual's knowledge of what was for his highest good and the practice of it.

Comparing the Greek with modern ethics, we note a great change. This change, aside from the slight effect in this direction the Stoics may have had upon Greek philosophy, is due almost wholly to Christianity and the revival of the study of Roman law. Christianity recognized a divine legislation as a guide for human conduct. This was the first step in the transition. More powerfully still did it operate in changing the aim of ethics from the perfection of the individual to the well-being of the *many*, of *humanity*. The great Teacher of Galilee sounded the keynote of this change in the utterance, "He that loseth his life shall save it." The utterance was profoundly emphasized when, in example, He gave his life for humanity.

The earnest revival of the study of Roman law in the twelfth century gave a new element to ethics,—natural law.

Scholasticism, which dominated in European philosophy at that time, recognized two elements in the moral code,—the one *Christian*, dependent upon revelation; the other *natural*, perceived by natural reason and binding alike upon all men, Christian or not. Kent defines this natural law as consisting of "those fit and just rules of conduct which the Creator has prescribed to man, as a dependent and social being, and which are to be ascertained from the deductions of right reason."

Modern independent ethical thought has its starting point in this century in the system of Thomas Aquinas. His was the genius that united those theological conceptions with the "abstract theory of the later Roman law," and so gave that start along which line modern ethical thought has advanced.

In his system, under general law, Aquinas distinguishes four different kinds: the Eternal law, Natural law, Human law, and Divine law. It is with natural law and human law that we are interested in this investigation. He teaches that natural law, which has already been defined, is that part of the eternal law that relates to rational creatures as such, and that human law "consists of more particular deductions from natural law adapted to the circumstances of particular societies."

He further teaches that "God has firmly implanted in the human mind a knowledge of the immutable, general principles of natural law, although the applications of them may be sometimes obscured and perverted by bad education and custom; and that human law is required not merely to determine the details for which natural law gives no clear guidance, but also to supply the force necessary for practically securing among imperfect men the observance of the most necessary rules for mutual behavior."

Here, then, we think we find the origin of class ethics, and, if so, the codes that govern societies. A code of ethics governing or regulating the professional conduct of members of a society has not been constructed on unhistoric ground, but as a result of the consensus of the philosophical thought of the ages. Should we abrogate the dental code, we would fall back again from modern ethics to the Greek, depending upon the perfection of the individual and setting aside the philosophical progress of these intervening centuries.

It may be, as Dr. Ottolengui says, that, as dentists, we have aped the medical profession. That is but natural, as it is the one to which we are most nearly related. We all know, and it has been forcibly demonstrated to us in the recent investigations of hypnotic phenomena, that we are creatures of suggestion. What could be more suggestive than the medical code? Grant that the medical code has had an humble, even unworthy direct origin. Here, too, comes in suggestion. It must be borne in mind that man is continually building on to something, instead of starting out anew.

That the medical profession, in adopting as a guide the set of rules which Dr. Percival had formulated for his son, failed to deduce from it a code worthy their profession, is perhaps true. That the dental profession, in imitating the medical, were not comprehensive-minded enough to develop it into a code that would protect and perhaps guide the professional man and hold in check the unprofessional one, is to be lamented. Still all these things argue, not the abrogation of a code, but the need of a better one.

Now that the subject, in the last few years, is being agitated, we believe the better code will be forthcoming. Since we have the defects of the old one to admonish, and added experience to enlighten, may we not hope for a code that will measure up to the standard of our present conception of the relationships and duties of professional life, and secure to each member that freedom which is one of the prime functions of a code? When that eminent physician of Brooklyn, Dr. Pilcher, intimates that a code of ethics interferes with his freedom, he certainly has not a true conception of ethics or the real aim of a code. It is through the idea of *freedom* that ethics is more closely connected with jurisprudence; for it is the "fundamental aim of jurisprudence to realize external freedom by removing the hindrances imposed on each one's free action through the interference of others' wills." He further says, "A set of rules is a mark of dependence," and we answer, Man *is* a dependent social being, and as such, to be a member of a society that has a code embodying rules of conduct in harmony with the correct notion of professional life, does not lower his dignity.

But should the better code that we anticipate be adopted, there still remains a serious aspect to this question. That the spirit of an ethical law shall be lived up to, requires men of ethical character. The law should not be depended upon to build character. That is not its prime function. Whence, then, must we look for that elevation of character of the individual members of the profession that will bring about a voluntary obedience to the spirit of a code of ethics? To the colleges? As it is through them our ranks are recruited, they would seem to be the Mecca of our hopes.

In this paper we are considering character in the sense of development, not in the sense of inherited qualities.

We realize that it is easier to criticise institutions than it is to make them more proficient; however, honest consideration of facts is always fair. Is a course of three years of six or nine months each sufficient to give a student a liberal education, the principles and training of dentistry, and a good moral character? It might impart the second, if the first and last were possessed to a good degree.

Yet we have in mind a graduate of this spring, who, when he entered the dental college three years ago, had not even a common-school education. It was not for lack of opportunity, either. Good schools had been continually within his reach; but he was an idle, dissipated youth, wanting in the elements of good character. At the end of three years, however, he has come out of college a D.D.S. Now, if the standard of Greek ethics prevailed to-day, and the good of the individual alone was to be considered, then, if receiving and graduating this young man improved him in any degree, the college would have been doing its duty; but in the light of modern ethics, when the good of the profession, the well-being of humanity, are the first aim, what of such a course? What must become the ethical character of a profession recruited with such men? This may be an extreme case, we admit, but we know of its parallel. If these extreme cases are allowed, even now and then, how many must be the intermediate ones between them and a proper standard of education and character? The student, or his parents, perhaps, paid his matriculation fee, tuition, etc. We mean no reflection. That old adage, "Money is the root of all evil," may still hold good occasionally.

It would *seem*, and we really think it would *be*, unjust to inform a student, after he had been in college three years and paid out his money, that he was unfit to become a member of the profession he had chosen. The mistake in such a case lies at the other end of the course. The means of a good high-school education are within the reach of every youth who has the mental and physical ability to become a dentist, and have been for the last twenty years. We must remember that *society ever measures up to the demands made upon it.*

What, then, is the standard of manhood to-day? Character. A development, not of the intellect alone, but of the soul. What, then, according to the thought and spirit of the times, may the professional colleges demand of the students who seek entrance to their halls? *Nobility of character.* We do not undervalue the influence of the colleges in the development of character, but we must bear in mind that the student has nearly passed through what is considered the formative period of life before coming under their influence.

It is, then, in this demand, on the part of the colleges, for nobility of character in matriculants that we must look for the ethical standard of the profession. For—we repeat the statement—society ever measures up to the demands made upon it. It is back of the colleges, to home and youthful environment, that we must look for good moral character, which with culture makes the modern gentleman. In the home and in society, what are the signs of the times? Here, too, we find the effects of the philosophical thought of the age. Never before, it is believed, have mothers been so awakened to their duty and power as character-builders in the home.

But what of the children outside of beneficent home influence? Organized society is at work there. All movements, from the kindergarten to the society that goes out to save the debauched man or woman from the gutter, show the tendency of the age to character-building. The statement so frequently quoted, "To make the world better we must educate," should be changed to denote a broader development. To make the world better we must develop man's threefold nature,—physical, intellectual, and spiritual. It further shows the harmony of the efforts of society with the ethical thought of the time. In these movements for the bettering of humanity, the individual unconsciously attains for himself the highest good,—the aim of Greek ethics,—while with conscious efforts he seeks the aim of modern ethics,—the well-being of humanity.

The forces at work in society indicate with unerring certainty that there will be an abundance of ethical character with which to replenish our professional colleges. The only question is, Will they demand it and accept none other? If they do *well* this their duty, society will meet their demands.

Though we would be optimistic, we would also be consistent. While good is steadily and surely marching on to its highest consummation, evil is stalking ever at its side. Despite all humane efforts, the degradation of childhood, youth, and manhood is startling to contemplate. He who would be wise must bear this fact in mind. The good must still be protected and the bad restrained; hence the need of a code.

The future, we predict, is not one of perfection, but one of happy enlightenment; when man from his infancy will be brought up in that rational manner that he shall be able to realize the relationships of life and the duties arising therefrom ; when, as a result, selfishness, that relic of barbarism that seeks individual good alone, will have been displaced by that nobler quality of the human heart that seeks the well-being of others. It is such an ethical development the present promises for the future.

### *Discussion.*

Dr. B. HOLLY SMITH. I hold in my hand a copy of what is purported to be about the first code of ethics prepared for any dental association. In the preface of this code the remark is made that this code of ethics is taken from the code of ethics of the American Medical Association—1847.

We are satisfied to trace our code of ethics to a medical association. The priests in ancient times were the repositories of all knowledge, and I believe that it originated with them in some fraternal feeling, and that the development of the present code under which we practice may have resulted from some such origin.

Ethics deals with that which is due by one man to another. It is the science of right conduct and character, which treads the natural ground of moral obligation, and the rules which determine the conduct of one person with respect to himself and the rights of others, —the science of an ideal humanity.

I believe that no man who writes a paper on such a subject would feel that he had discharged his whole duty to the profession if he did not call up before him, and administer, in the presence of the association, a full and drastic dose to the colleges. I believe that that is commonly expected. I am sure that no one will dispute that the obligation of the colleges to the profession is a very serious one ; that, as teachers, we are to prepare young men not only to practice their profession, but to associate with their brethren in a simple and becoming manner ; and I am fully in accord with the gentleman when he says that some ethical training should be sought and secured from the colleges. I would like to see, as a teacher, the state of affairs recommended by the National Association of Dental Faculties, that every man who receives a diploma from a dental college should be required to subscribe to a code of ethics. I would like to see it arranged so that his violation of that code would abrogate his rights to practice under that diploma. I don't know how practical this suggestion is. That suggestion was made by the essayist, and I am willing to place the ground as high as we can possibly occupy it. If such an understanding were had with the students who graduate from our colleges, I believe that in moments of disappointment, in the moments of waiting, when the young man thinks, Hadn't I better turn quack and advertise for patients? I believe that such an act on his part—subscribing to a code of ethics—would strengthen him and enable him to hold out until, through his society and his *confrères*, he could respectably, in due course of time, build up a dental practice. While we look to the colleges for some ethical training, I do not agree with the essayist that we could exact of the colleges a moral standard of character from its students. The college is in no wise responsible for the morals of those who attend its lectures, and it cannot be held so. It is true that there should be, on the part of its corps of professors and teachers, the high moral obligation to, by personal bearing, conduct, and example, teach, as far as is practicable by precept and example, a gentlemanly life and behavior. Further than that I think we cannot exact of the faculties or of the colleges.

It has struck me that there is some room for improvement among our associates and among ourselves as dentists, in the line of our relations with our patients, our acceptation of what they say, and our reliance in the credibility of any report they may give in reference to our brother practitioners. We have also a right to exact from the journals the same respect that we exact from our associates ; and the day is past when a man can come into a dental association with all his patent-medicine bluff and bravado and push his wares and ideas through a scientific organization.

Dr. MAXFIELD. I believe that the future of our profession depends upon ethics. That point was brought out in the discussion of the paper of my friend from Chicago, in the reference to an article by Professor Miller, in which he says that the kind of treatment given his patients depends upon the size of their pocket-books. Now, I ask you if that is good professional ethics. If that is not trade, what is trade?

I cannot outline any method of procedure for the future, only that which stands on the code of ethics, the only true Christian code, that a man must do what he can for his brother. I know it is a hard thing, I know it by practical experience, to sit still hour after hour and day after day, not seeing a patient, and at the same time seeing your advertising competitor thronged. I know what it is to see an advertisement in the paper, and to know that you cannot say anything to the public in answer to it ; first, because the rule of the society forbids it, and secondly, because if you do answer it the public will say you are jealous. So you cannot give the truth to the public. Now, we must educate our members, we must educate the young men who come into the profession as to what it is to be a professional man ; that we are not working for dollars and cents alone ; that while the work done is worthy of its price, yet the price should not be first.

Our colleges have got to be more particular in regard to the young men they are taking in.

Dr. WILLIAM H. TRUEMAN. My brother here made the remark that we are working for dollars and cents. I should like to know why we should not. It seems to me that this idea that there is a difference between a professional man and a business man is mere theory, and cannot be borne out in practice. I would like to ask what it is that an honest, upright business man may do that a professional man cannot do? What can I do as a business man that I cannot do as a professional man, and what can I do as a professional man that I cannot do as a business man? I consider myself a professional man, but I consider myself a business man also, and I am very sorry indeed that I am not a better business man than I am. If every professional man were a business man there would not be so many of those sad cases where, after a long and brilliant professional career, as age advances and they lose their grip (as lose it we will, if we live long enough), the outlook reveals nothing but poverty and the grave.

I have seen many such cases; some are very, very sad. How much better it would have been for them, their families, the profession, and the communities in which they lived had they been better business men, and had paid more attention to that important matter of dollars and cents.

Exception was taken to Professor Miller's remark about the difference in his services to different patients. I think Professor Miller is right in that. He recognizes, as every thinking man must do, that the poor have claims upon the services of our profession as well as the wealthy; he recognizes also that people of limited means are far more numerous than those who are able to pay liberal fees. Now, in what other way can this condition be met? I would ask the gentleman who made that remark, What would he do? What would he advise others to do when a man earning six to twelve dollars a week, out of which he had himself and a family to keep, applied for relief from an aching tooth? Would he curtly tell him, simply because he was poor, that he had better have it out; or would he take from him a month's wages, treat and fill it for him in the highest style of the art; or would he do as Professor Miller suggests, and by a more simple and less expensive service do for that tooth the best that could be done for a fee its owner was able to pay? What does the code of ethics suggest upon that point? There are vastly more poor people, and people of moderate means, than people of wealth in every community, and if you will take the trouble to examine into the matter, you will find that those poor people need a dentist's services quite as much, if not more, than do their more wealthy neighbors. Is it a violation of the code of ethics to endeavor to adapt our methods to meet their needs? If so, why?

Professor Miller recommends one treatment for those who are willing and able to pay, and another for those who are not. Do not physicians do so? The millionaire's wife comes in suffering from, say, nervous prostration, and they say to her, The best thing you can do is to cross the water and spend six months in Italy or Southern France; and probably that is the very best thing she could do. But is that their advice to the mechanic's wife? They have to advise the mechanic's wife differently. A man must adapt his treatment to suit his patient's means. Now, I would like to ask in what way, manner, form, or shape does this violate the code of ethics?

It seems that we cannot get along without hitting a blow at the colleges. I have no patience with it. I believe that our advancement as a profession is to a very great extent due to the colleges. I think they are doing a manly work. If there are any men in the profession who are making sacrifices to advance the profession, it is the men who are teachers in the colleges. Have we seconded their efforts? Where are our libraries? Where can I go for information if I want to study any professional subject, or to examine dental books that I do not own?

Why is it that there are no adequate means in our own profession for studying the science of dentistry? Simply because the rank and file of the dental profession have not done their duty in following up the work of the colleges. The college simply gives its students the beginning of an education; they cannot say what the end shall be. You cannot say that of your children, whose characters you are supposed to mold from birth to maturity. I know it is said, "Train up a child in the way he should go, and when he is old he will not depart from it"; but somehow a good many sons and daughters get into wrong ways before they get old. Is that always their parents' fault?

Dr. MAXFIELD. Mr. President, I don't think the gentleman who has just spoken quite understood the ground I took in reference to business and professional ways. When a patient comes into your office and you size him up to see how much you can get out of him, that is business; when you examine the case to see what you can do for your man to help him, that is professional. That is the difference. I did not mean to give a drastic dose to our colleges, I did not intend it; but we all know that a great many incompetent men have been graduated from the dental colleges. I know how honest the dental colleges are, but I know that if we want them to be on a higher level we have got to bring the profession up to that high level, and then the colleges will be there with us.

Adjourned till 8.15 P.M.

## *Evening Session.*

The PRESIDENT. Gentlemen, the paper to be read this evening is by Dr. James G. Palmer, of New York, and is entitled—

## DENTAL LEGISLATION; A PLEA FOR AN INTERSTATE REGULATION.

It is not my intention to discuss the advisability of dental legislation, for nearly, if not all, the states and territories have dental laws of one kind or another; and whether such legislation has been wise or not, it exists.

The exclusiveness and strictness of the law in New Jersey, as well as in some other states, have been adversely commented upon, and especially that portion of it which compels *all* who intend practicing in New Jersey, whether recent graduates or men of years of experience and of high standing in the profession, or those who have passed examination before other state boards, to pass a rigid examination before its state board. I want to urge some step looking to an interstate regulation in this respect, and I want to see New Jersey take the front rank in this matter.

For a great many years I have been an active member of this society; was its president in 1883–1884; and I have always been in accord with its doings and legislation. I was a member of the *nominal* Board of Examiners, which, under the law, became the "Commissioners in Registration," etc., when the present law went into effect, and was, therefore, a member of the first commission, and had much occasion to observe the working of the new law. While there were some defects, on the whole the law worked well, and especially achieved that which was desired,—a *complete* registration. Under the new law all had to register with the secretary of the "Commission." Before that the applicant registered with the clerk of the county in which he located, if he registered at all. Some of these county clerks did not know what was required, nor did they care. One could show anything purporting to be a diploma, and be allowed to register. The lists of reputable dental colleges sent to each county clerk were rarely preserved. Unless some dentist in the county interested himself enough to inspect the register and report to the secretary of the state society, one might go on unmolested for years. Some did so go on.

Notably in Mercer county, the clerk failed to get a book of registry, and refused to do so when asked by those desiring to register. He did not do so until Dr. Wilson, then of Princeton, secured the services of a lawyer to compel it; and the failure to procure the book came near causing trouble for other practitioners in Mercer county who had been unable to register, although they had attempted to do so, and who, by reason of not being registered, became amenable to the present law.

All this was changed.' Under the new law registry could be with but one, the secretary of the Commission, and not with him until the Commission approved. As a result, New Jersey is spoken of as being very strict, and that one has to be well up to pass an examination and be allowed to practice.

But even in the first few months of the new law it was brought forcibly to our minds that the law was too rigid, that it operated in a manner not at all expected or intended. One of our own members, who had been a member of the state society for years, and had been energetic in securing the passage of the new law, was amenable to its provisions, because he had failed to register with a county clerk under the previous law, and, as a result, he had to appear before the board, pay his fee, and pass an examination. It seems needless to say that an examination under such circumstances would not have been very strict. The matter was discussed by the members, but no remedy was offered. Since then the matter has been in my mind, as well as in the minds of others, a great deal.

I did not know, until long after I had promised this paper, that a similar paper was to be read at Washington, D. C., by Dr. Sweeney, of Baltimore. It appears in the July COSMOS, and is an admirable paper, touching upon the legal aspects of general dental legislation in a masterly manner. He quotes from the *Items of Interest* what I had intended to take for a text, viz:

"Dr. W. S. Elliott, well known as one of our best and ablest men, has answered four hundred written questions for the privilege of practicing in Trenton, N. J."

In referring this concerning Dr. Elliott, to a member of the New Jersey board, I was assured that it was incorrect. He did not have to answer any such number of questions, and the examination was in fact merely an informal one. I doubt very much if I or any member of the New Jersey examining board could answer all the four hundred questions.

Later I was informed by a prominent practitioner of another state, whose laws are very strict, that in the case of two or three gentlemen whose names he mentioned the examination was informal because he knew their standing and ability.

Then comes the inquiry, If informal, why at all? Would it not be best to modify the laws even if, as in a report to the American Dental Association in 1892, the committee states that "it could not be hoped for unless the profession was willing to level downward rather than upward"?

The members of the National Board of Examiners are from the various state boards. They legislate for the states; they represent the states in the American Dental Association; they agree upon certain regulations as binding upon *all* the states they represent. By their combined action and influence they forced the colleges to a term of three years; yet the certificate granted to Dr. A. in one state by members of this national board will not be accepted in another state by other members of the national board because the state laws are different.

There certainly ought to be some regulation in regard to this matter, ignoring state lines and state laws entirely. There should be some standard, and one who comes up to that standard and is granted a certificate to practice in New Jersey or any other state should be allowed to practice anywhere within our borders.

I am not raising the question now as to whether it is best to require a new examination of the recent graduate or not; but having *once* been given the right to practice, the law should be broad enough to cover every state. Look for one moment at this: Suppose Dr. W. D. Miller, of Berlin, a man well known the world over, should wish to locate in Massachusetts or in New Jersey. He would be *compelled* to pay a fee, and at least *appear* to pass an examination. This is all folly. Does it not look so?

I want to see New Jersey go to the front in this matter. This year much will be done, both in the Southern and the American Dental Associations, toward settling the question. Let New Jersey show the way, if possible. Let some standard be agreed upon, and let New Jersey gain all it can therefrom.

## *Discussion.*

Dr. W. C. BARRETT, Buffalo, N. Y. Dentistry in America can never be what it is in other countries. The very nature of our government and the genius of our institutions forbid the molding of any profession into one consolidated, concordant whole. We have nearly fifty separate states, each with its own distinct autonomy, each supreme in the management of its internal and domestic affairs, and each with its separate interests and environments. It is probable that no other form of government could preserve harmony among so many and such diversified conditions. That which would conduce to the best good of the comparatively dense population and the manufacturing regions of the eastern states might be but ill adapted to the wide prairies and the agriculturists of the west. Hence it is folly to look for such unanimity of purpose and harmony in methods as may easily be brought about in countries like England.

But that there should be such wide diversity in the conduct of professional affairs as exists in different states of the Union to-day is quite unnecessary. To secure a better state of things should be the desire of every professional man. This can only be done by systematizing our educational methods. In some of the states there is practically no restriction in the number, or regulation in the methods, of professional schools. All that is necessary is for a few men formally to incorporate themselves under general laws, when they may open a college and grant diplomas and confer degrees without any supervision whatever. As long as this is the case, the profession in other states whose schools must comply with strict regulations cannot be expected to accept these cheap distinctions without question. Hence the enactment of laws, passed at the instigation of members of the profession, which subject the graduates of even the best colleges to an examination by a board, sometimes composed of men totally unqualified for the task. In the state of New York no school that confers degrees can be chartered without first actually raising the sum of fifty thousand dollars in cash for its proper equipment. In some of the western states it costs but five dollars, the fee for issuing the permit.

All dental legislation should, in my opinion, commence with the proper regulation of educational methods. Let me briefly state what is the system adopted in the state of New York, which presents many advantages. All institutions of learning, above the common schools of the state, are under the direction and control of the University of the State of New York. This is not a teaching body at all, its work being supervisory and governmental. Its power is vested in a board of nineteen regents, elected by the legislature for life, in the same manner as United States Senators, who serve without pay. No degrees can be conferred without their authority, and they may charter or annul the charters of any high school or college. They determine the requirements for entrance to any educational institution above the common school, and the qualifications for graduation. All examinations for either are conducted by them, at such times and places and under such restrictions as they may determine. These regents' examinations give a uniform and impartial standard, applicable to all circumstances. Under their authority the professional schools instruct, but do not license to practice. Medical schools, for instance, may confer the degree of Doctor of Medicine, but that does not carry with it the right to enter upon practice. That privilege is only bestowed by the board of regents, which appoints examining boards, before whom graduates of whatever school must appear for examination. This removes from the colleges any temptation to graduate incompetent men, for they know that such student cannot pass the final crucial test, while his rejection is a reproach to the college that pretended to educate him.

The board of regents are now about placing dentistry under the same regulations. No one will in future be permitted to enter a dental college in the state of New York without the possession of a regents' certificate of the same grade as that demanded for medicine. The course must be the same,—three annual terms of not less than seven months each,—and the same requirements are demanded for graduation, while the regents alone can license to practice. The board thus retains full control of the education of all dentists of the state, because it will not admit to an examination for a license to practice the graduate of any school, whether in or out of the state, that does not maintain the same standard for both matriculation and graduation. This places dentistry on the same plane with medicine, and in the eye of the law and the community it has precisely the same professional status. There is a definite, unbending standard ot requirement for matriculation, and one that cannot be varied at the will of college authorities. They have nothing to do with receiving students, except to admit those only whom the regents declare qualified, and they cannot launch upon the community imperfectly trained men. It seems to me that this system presents advantages that none other does, for it binds the hands of college faculties who might be disposed to relax wholesome requirements. If it were possible to extend such a system to every state, the other embarrassments would regulate themselves.

I have purposely refrained from speaking of any feature of legislation save that which should regulate educational affairs, because it seems to me that this lies at the foundation of all restrictive acts, and because the limits of the duty assigned me forbid further amplification.

Dr. B. HOLLY SMITH. The dental law of New Jersey is regarded as one of the most stringent, and I do think that the existence of such a law in all our states is unnecessary. I have felt, from the time I began to think and to write upon this subject, that as long as there are different dental laws in the different states, New Jersey is right in making as stringent a law as she pleases. However, it is with great pleasure that I recognize the olive branch which is thrown out from New Jersey this evening; it is with great pleasure that I recognize, coming from one of the states which has, probably, the most stringent law on its statute-books of any in existence, a movement for the unification of our dental legislation. I am free to confess to you that I am willing to accept the statement of the chairman of the committee appointed to look into the suggestions of the president of the American Dental Association, who said that any such thing as the acceptance on the part of all the states of a law the conditions of which would allow all the states to come in, would be in the direction of leveling downward; in other words, the exactions of the law in a great many states would not measure up to the law of Massachusetts or New Jersey, and Massachusetts and New Jersey would have to measure down to them; we could not hope to secure for all the states a law as severe and stringent as the laws of Massachusetts and New Jersey.

I have advanced with considerable temerity, and with some trepidation and fear that there would be no prospect of enforcing my views in this matter. I have held, heretofore, that students who had attended a regular course at a reputable dental school, and who had passed the examination at the end of the course, should be allowed to practice their profession without fear or hindrance on the part of the law; and accepted the statement that has been made time and time again, that the examining boards are no other than policemen to enforce the law. I have hoped that it would be possible to enact such a general law that every man who has graduated from a reputable school may be allowed to practice in this free country wherever he would go, whether in New York, or New Jersey, or Massachusetts; but it seems to me, in the light of recent enactments, that such a hope is a forlorn one. If harmony could be secured in the dental profession to accomplish that, the expressions of peace and pleasure which would follow such enactments in New Jersey, New York, and Massachusetts I do not think would compensate for the liberty which would be allowed to cross-roads schools to turn into the practice of dentistry a horde of men who are coming up into the profession to-day. There may be some advantages in this, and I advance my views with a great deal of timidity. I possibly am wrong. I do not care who examines the student. The proposition I made at Lookout Mountain, two years ago, and subsequently presented to the American Association, was that after a course, a finishing course at a dental school, some authorized body, say the examining board of the state in which the college is located, should examine the student, such examination to be just as rigid as may be desirable on the part of the examining board. Those examiners could turn down as many of the men who had matriculated at the college as they thought were unfit to pass the examination. The proposition was not favorably received.

I do feel, as a teacher, this: It is with great humiliation and discomfort that I hear from New York, or from any source, that a man who has spent three years with me, and with whom I have worked patiently, and who, after that work, I have determined is fit to go forth to practice his profession, has been tripped and thrown by an examining board. Gentlemen, this means something to us. We are in the profession, yet there are just as good men coming into the profession as we are, and they have their rights too. They are not here to speak for themselves, but it is only fair that we should be lenient and reasonable with them. Let me take a man and prepare him for any examination, and I will do it; but, in heaven's name, after he has worked to that point where he is prepared to pass, and has passed that examination, do not say that, in a year or two years, after he has located at a point and has a little prospect of success, he must go through another examination by your boards. I think it is unfair and wrong.

I believe that one harmonious law for all this country will work greater good to the dental profession, and is of more importance, than any elevation that may accrue to a single state because of a single statute on its books. I congratulate New York. Let her go ahead. If she can by any means elevate the general tone of the dental profession, I say amen; but when with jealous eyes she looks down upon her inferior and humble sisters, would say that we have a statute on our books which provides that an examination equal to that for the degree of A.B. must be passed by the applicant for entrance to the college, or graduation, I cannot help feeling that this is not a step toward unity or a step toward harmony, and for that reason I feel sorry that at this time, when everything looks fair toward a harmonious adjustment of this question, that this movement, which, of course, is not a retrograde movement, should come up to interfere with this harmonious adjustment. I do hope that a committee from this association will come to Old Point Comfort to hear a continuation of this discussion. I do hope, as has been suggested by my friend Dr. Donnally, of Washington, that a committee of the Southern Dental Association will be appointed to meet with committees from every dental association that may take an interest in this question, and that through these committees we may reach some harmonious conclusion.

Dr. G. CARLETON BROWN. Last January the New Jersey State Examining Board decided to issue an invitation to the examining boards of the eastern and Atlantic states, to meet at Asbury Park on Tuesday of this week. The invitation was accepted almost universally; the meeting was held, and we have decided two or three points, as well as considered many others. Of the two principal points, one was the interchange of licenses, by the adoption, or the attempt at adoption, of similar laws in the different states, with similar requirements, and an examination that should be up to a certain standard. The other point was in regard to preliminary education. New York came forward with her advance. Just what this convention did I do not suppose it is my province at this time to bring forth, but I assure you that a great deal of good, solid work was done, the results of which, we think, will benefit the profession, the examining boards, the colleges, and everybody who loves dentistry.

Dr. Palmer referred, in his paper, to the strict requirements of the New Jersey Examining Board. Whether we were right or wrong, gentlemen, I don't believe there is one man in this room who will say he thinks we did not mean right; and whether we were right or not in the line we took, we have gained this result, that young men are educated in such a way as they were never educated before. When we first commenced our examinations the average of graduates that were turned down was fifty per cent.; and in our last examination, held last week, every graduate in the class of '94 passed, giving us the best average we have ever had. They were the best educated set of young men that ever came before us, every one of them practically fitted and able to go out and cope with the world in his profession. This is what we started out to accomplish. Before we undertook this work, young men were not properly educated to practice.

One other point in Dr. Palmer's paper. He said that the examinations of some of these practitioners from outside of the state were informal. That is a mistake. They were not informal. They did not get the same examination that recent graduates got. We would not expect a man who had been in practice fifteen years to be as well posted in anatomy, physiology, pathology, etc., as a recent graduate; and we would not expect to call upon a man who had been in practice a number of years to fill teeth, do soldering, or do extracting, that we require of recent graduates; but we do give them an examination that is not at all informal, and an examination which, if they were incompetent, they could not pass. We have had men come here who have practiced outside of the state who cannot practice in New Jersey. They are not competent.

Dr. Barrett's paper was a *résumé* of recent changes in New York state. I think it is a great advance. New York has jumped ahead of New Jersey this time, in that line, and I think they have jumped in the right direction. Of course a step in that way may be a little too far, or a little short of what may be practicable, but as long as they are striving in the right direction, gentlemen, help them. We are ready to follow if New York can go ahead.

Dr. Smith spoke of it as being a shame that young men, after they had graduated from a reputable college, should have to come up before an examining board. So it is. It is a shame, but whose fault is it? What made the examining boards necessary? Gentlemen, it was the colleges themselves. The colleges did not educate young men, and they had to be forced to do it. We believe in protecting the public and protecting the dentist, and in protecting the student. The student is an embryo dentist only, and if he is to come into our ranks we want him to be educated so that he can take his proper place, and in many instances he was not being properly educated. We raised our standard, and the result was that the colleges raised their standards. Before that, what had we to go by? We sent lists of what were called reputable colleges to the county clerks. Who made the list of reputable colleges, and what did they know about what those colleges were doing? Who knew what education the colleges were giving? Nobody, until the different examining boards reviewed their work; and then the colleges came down very quickly, —I mean those that were making this trouble. As to the really reputable colleges that were at that time educating their students just as well as they are now; it did not hurt them any, and it did not hurt the student any. It simply helped the student who was paying to be educated to practice dentistry and did not get what he paid for. Now he gets it.

As to the enactment of a universal law, that is a Utopian plan that is very beautiful to contemplate, but will we ever get it? We believe a high standard should be reached if it is possible, if it is practicable; and if the United States were no larger than New Jersey we would have a general law, but I doubt very much whether we would ever be able to agree among ourselves upon a general law; and until we could agree, how would congress give us that law? It seems to me that the solution of the problem can, for the present, be left in the hands of your different examining boards, to be worked out in connection with the Board of Faculties of the different colleges. Those two bodies are, I think, harmonizing closer and closer all the time. They are both educators. Most of them are true men and dentists, and the examining boards are, every one of them, working in the interest of their profession, without fee or reward.

As an outcome of the meeting which we had here on Tuesday, and from which a memorial will be sent to the National Association, making certain suggestions and asking their opinion and suggestions on certain lines for discussion, I think that next year we will be able to present you with a still greater advance in the course of education.

Dr. B. F. LUCKEY. There is one other aspect of the case that has presented itself to my mind. For years it has been my belief that, if the solution of this problem could not be brought about by harmonious relations between the legislative authorities and the dental law-makers and manipulators of the different states, the only other solution was the appointment of a national examining board,—appointed, if you like, by the colleges themselves, or selected by the colleges themselves,—to do a fixed duty and service; all graduates to be examined by this open board. Let the standard be fixed as high as possible, and make every college come up to that standard. Those colleges that failed to come up to the standard would suffer the same defeat that the student does now before the state examining boards or the individual examiners of the colleges. I think that would establish a standard that would make it impossible for any state to pass laws properly regulating the standard of dentistry in such state. We certainly would never have had a law in this state as rigid as it is had it not been necessary for us to obtain it. It was a necessity that forced it upon us. There were reputable colleges, but there were lots of disreputable dentists coming from them, and they came largely to us. We are situated between New York and Philadelphia, the two prolific schools which turned out not only many competent men, but many incompetent men. It is true that all men do not reach the same standard; but if the examining boards, in their wisdom, could so draw the line that the utterly incompetent and disreputable could be shut out, it would be unnecessary for any state to pass such laws as we have had upon our statute-books. I hope it will be possible for the examining boards to agree upon their laws, regulations, and requirements, so that we can have a uniform standard. If they cannot agree, I hope it may be possible for us to have a national examining board.

Dr. JAMES TRUMAN. Mr. President, I am an outsider. I don't know that I ought to say anything. The colleges are not regarded here with very much respect, and I am a representative of a college. In the establishment of these lines the colleges have not been consulted; on the other hand, there has been throughout almost an effort to persecute the colleges, and an endeavor to force them into certain lines of action. It struck me, as I sat here listening, that the assumption that has been made is very cool, to say the least of it, that all advances that have been made in college instruction have been done by the boards of examiners. Why, gentlemen, the fact is that all the movements toward improvement have been made by the colleges themselves, without any outside force. As a member of the National Association of Dental Faculties, and one of its organizers, I can state, from personal knowledge, that all the changes toward the elevation of the standard of education in the different colleges in this country have been through and by the action of that association; and it is rather late for the boards of examiners to come in and assert that they did it all. We are all workers. I admit that the laws that are on the statute-books of the different states in this country to-day cannot now be set aside. We must take them as they are. But what are they? Are they constitutional? Has one state the right to legislate against another state in this confederacy? I am not a lawyer, but I believe that if that question ever comes up before the Supreme Court of the United States it will be shown to be unconstitutional. It cannot be constitutional. We know that the different states—I am not speaking of New York, because I know very little about it, but I do know a great deal about the different states, as far as dental laws are concerned, and I know very well that comparatively few of them have laws by which the boards of examiners are not appointed by the governors. They are purely political. What a condition of affairs is that where the student who has spent three years, at great expense, in a dental college, and has passed an examination there by fully competent examiners, is then required to go before a board of examiners whose authority exists simply in the governor having appointed them to office, who know nothing about the different subjects they examine upon! I know very well that some of them know absolutely nothing about the different subjects that they pretend to examine upon. Is not this something for the colleges to feel sore about, when they have spent three years in the endeavor to manufacture a dentist out of a man, and have found him competent to have him go before an examining board that is absolutely ignorant? If you knew as much about this business as I do, you might feel differently. I had a man write me from Texas, saying he was appointed on the examining board, and he said, "I don't know what you examine about. Won't you send me a list of questions?" I said, "No; I have nothing to do with it. Go to some compend and take them out of that." He did so; he wrote me so. Now think of a student going before men to be examined who have nothing better than a list of questions taken out of a compend.

Did it strike you in this morning's meeting how a student might come before a board? There were not two men in this body who were agreed upon the treatment of the pulp; and a student coming before such a body would probably be thrown on the treatment of the pulp, from having been taught in different schools in a different way. You see the difficulty of this question. Now, I think that if the colleges had been met fairly at the start, if committees had been appointed to meet with the colleges and consult with them in regard to this question of laws, there would not be this antagonism. We are not opposed to a further examination, but we want it done right. It requires as much intelligence to examine a man as it does to teach him, and more. The Pennsylvania State Society, a week ago, adopted a resolution that they would have a new state law, and that before that law should be sent to the legislature for enactment it should be submitted to a committee composed of members from each of the colleges in the state, as well as members from the societies. That is the proper way to do the thing. Come together and consult, and not undertake to legislate for the colleges without saying anything to them, and demanding that their students, whom they have spent so much time over, and who have spent so much money to be educated, shall come up for re-examination at almost double the expense. Gentlemen, it is not right. It will never be right until you come to the colleges and say, We will meet you half-way. Then you will have something accomplished, and that will be the rule hereafter in the state of Pennsylvania.

(To be continued.)

## UNION CONVENTION IN BUFFALO.

(Continued from page 147.)

### FIRST DAY—*Evening Session* (Continued).

### *Discussion of Dr. Eschelman's Paper.**

Dr. C. S. BUTLER, Buffalo. In the whole realm of pathology there is no single phenomenon of greater significance, nor which has received more serious and earnest study, than the "etiology of pus-formation," and concerning which there have been so many and such divergent theories, especially during the past quarter of a century, where theories have succeeded one another in such rapid succession that one can do little more at the present time than survey the field upon which pathologists have so fiercely contended for the supremacy of their own views, and which is strewn with broken-down and abandoned notions concerning the inflammatory phenomenon.

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* "The Etiology of Pus-Formation." See DENTAL COSMOS for February, page 143.

To confine this discussion strictly within the lines laid down by the essayist, we have simply to inquire, "*What causes pus?*" and any study by which this question may be answered is inseparable from a consideration of inflammation, which, though not the initial lesion, is nevertheless an ever-present accompaniment of suppuration; and just here the essayist is quite misleading when he says, "Superficially studied, pus would seem to be the product of inflammation; but this cannot be, for inflammation does not always form pus." If what the doctor intended saying was that inflammation *was not* the primary cause of suppuration, otherwise it would under all circumstances produce pus, no fault could be found with his teaching, for it is a well-established fact that the primary or initial lesion is cell-irritation generally, if not always, caused by micro-organisms; *but pathologically there can be no suppuration without inflammation*, and the reasons why pus does not always follow as a result of inflammation will appear as we proceed.

The nutritional theory of inflammation put forward by the essayist, and announced by Virchow in his "Cellular Pathology" in 1871, is not sufficient to account for all that is now known regarding this phenomenon.

The similarity of expression observed in the higher orders of the vertebrata, especially in man, and which has been termed physiological and pathological nutrition, is only apparent, not real. The flushed cheek, accelerated pulse, and increased peripheral temperature are expressions of a vascular and nervous system in a healthy though somewhat excited condition, and can no longer be considered expressions of cell-irritation in the sense they were so regarded by Virchow and others.

In a long series of experiments that seem conclusive, it has recently been shown that while the vascular and nervous systems greatly augment the inflammatory phenomenon, *it is in no sense* dependent upon them.

In a course of lectures on the "Comparative Pathology of Inflammation," delivered at the Pasteur Institute in 1891, Professor Elias Metchnikoff undertook to show that what is known in the vertebrata as suppurative inflammation exists also in the invertebrata, even tracing it downward to the lowest forms of animal life,—the amœba, protozoa, and infusoria. So thorough had been his researches, and so convincing the arguments put forward in support of his views, that the leading pathologists of Europe and America at once accepted them as correct, and have since changed their teachings on inflammation to conform to the new doctrine; and there is no doubt that the researches of Metchnikoff "will cause a revolution, inasmuch as he has conclusively shown that inflammation is not dependent upon the vascular system, but may occur in tissues devoid of blood-supply."*

Thus, like so many of its predecessors, falls the nutritional theory of Virchow, which assumed that "a greatly increased flow of nutritive substances took place toward the inflamed part; that, in fact, inflammation began from the moment nutritional derangement occurred, said derangement consisting of the attraction of large quantities of nutrient substances, so that the cells of the inflamed organ received an excessive amount of nourishment at the expense of the blood-supply."

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* Parmenter.

So, too, with the vascular theory of Samuels and Cohnheim, introduced by the essayist to explain the crowding, in active inflammation, of the intercellular spaces with leucocytes and red blood-corpuscles. These eminent pathologists held that "inflammation consisted essentially in a molecular lesion of the vascular walls; that the latter, modified by some injurious agency, lost its power of retaining the blood-corpuscles, which therefore, in consequence of the force acting upon them, were driven out of the vessels, and then wandered toward the part of least resistance."

Compare these theories of Virchow and Cohnheim with a few sentences from Metchnikoff, and a wide discrepancy will at once appear. He says, "The study of inflammation in cold-blooded animals teaches us that increased temperature is not a necessary factor, and that the analogous reaction in the invertebrata proves that inflammation may occur without any intervention on the part of the blood-vessels." What, it may be asked, will be the effect of this new doctrine upon the generally accepted theory of suppuration? It is to be regretted that Metchnikoff should not have gone a step further and given us a chapter on pus-formation, though his promise to do so in the near future warrants the anticipation of a rare treat in the studies of comparative pathology when the results of his labors in this direction shall have been given to us. Meanwhile it is probably safe to assume, as the essayist has done, that the initial lesion is due to micro-organisms, and that true pus is unquestionably the product of pyogenic bacteria.

I say true pus, for we cannot longer apply that term to everything having the appearance of pus; only that which contains bacteria, and is capable of propagating itself when engrafted into culture-media, is now regarded as pus. (Park.) The process by which the formation of pus is brought about is styled by Metchnikoff as a struggle between two living species, and by Virchow as "a battle of the cells." The pyogenic bacteria, which are generally if not always present in tissues of the body, make an attack upon some vulnerable organ, and instantly leucocytosis is established and a desperate battle ensues. The leucocytes englobe and digest the bacteria, while the latter by their toxic action overcome and destroy the leucocytes. Whenever in the course of the struggle the leucocytes are able to gain a mastery over the bacteria, resolution takes place, and the inflammatory phenomena subside without suppuration. On the other hand, the bacilli gaining the mastery, the myriads upon myriads of leucocytes that are thrown into the encounter are overcome, and suppuration results.

For many years it was generally thought that the leucocytes which gathered in an inflamed area acted only as scavengers by absorbing dead cells and microbes, but it is now known that they do more than this, and from the very onset of infection wander toward and englobe the parasites in a living condition; and as the process here described is precisely the same in the protozoa as in the vertebrata, it follows that their migratory power is due *not to the vascular circulation*, as has been supposed, but to their amœboid character.

"It has also been shown that the action here described as taking place outside the vascular tissues occurs also within the vessels themselves, and explains the comparative immunity from suppuration from the presence of pathogenic organisms in the blood-stream, as in recurrent fever when the blood is crowded with spirilla, yet without diapedesis; the leucocytes devouring the bacteria within the blood-vessels. So, too, with the anthrax and tubercle bacilli, which, though highly infectious when injected subcutaneously, cause no inflammation in the sense used by Cohnheim, when thrown into the blood-current. By this it must not be assumed, however, that suppuration never occurs within the blood-vessels, embolic abscess being a good illustration of the power of bacteria to gain the mastery even here, when the conditions are especially favorable for their propagation. If, then, the etiology of pus-formation is a "battle royal" between two living organisms, why is it that certain highly infectious diseases, like chicken cholera, septicemia of guinea-pigs and pigeons, and many others terminate fatally, with little or no apparent attempt on the part of the phagocytes to withstand their onset?

It was found by Binz some years ago, in a series of experiments, that no diapedesis took place through the frog's mesentery after this had been moistened with a solution of quinin. As quinin acts poisonously upon protoplasm, it was concluded that it paralyzed the leucocytes, which were consequently unable to pass through the vascular wall. The same experiments were repeated by Disselhorst, who confirmed the fact that diapedesis ceased, but was astonished to find that their movements were not paralyzed, for when removed from the vessels the leucocytes showed their wonted amœboid activity. In order to explain these facts, Disselhorst maintained that the assistance of the vessel-wall was indispensable for the passage of the leucocytes, and that the diapedesis was prevented by the action of the quinin upon the wall. In his arguments no account is taken of the chemiotaxic property of the leucocytes, which was not at that time an accepted fact.

If this function be admitted—and there no longer seems any doubt of its existence—the effect of the quinin may be referred to as a negative chemiotaxis of the leucocytes, which while retaining their mobility, do not move toward the part moistened with it, but are able, while still within the vessels, to detect the presence of the obnoxious substance. This negative chemiotaxis explains the inaction of the phagocytes in the infectious diseases above cited, as it is a well-known fact that their microbes are not englobed by the leucocytes when brought in contact with them.

From the foregoing we must conclude, then, that the "essential originating factor, the *primum movens*, of inflammation, consists in a phagocytic reaction on the part of the animal organism. All other phenomena are merely accessory to this process, and may be regarded as a means to facilitate the access of the phagocytes to the injured part." (Park.)

To conclude this discussion, I cannot better sum up the whole matter than by quoting a short paragraph direct from Metchnikoff himself, in which he says, "The study of inflammation from the point of view of comparative pathology proves, first of all, that this phenomenon is essentially reactive in its nature. The organism, threatened by some injurious agency, protects itself by the means at its disposal. Since, as we have seen, even the lowest organisms, instead of passively submitting to the attacks of morbid agents, struggle against them, why should not the more highly developed organisms, such as man and mammals, act in the same manner? We must conclude, then, that the invaded organism fights against the injurious cause; but in what way? As the evolution of inflammation shows, it is this phenomenon itself which is both the most general and the most active means of defence among the animal kingdom."

Dr. W. C. BARRETT, of Buffalo, said such a subject was impossible to discuss in the time they had at their disposal. In the first place, what is pus? Its distinguishing characteristic is the pus-corpuscle. This is supposed to be the dead blood-corpuscle. There are other things that enter into the composition of pus, such as broken-down tissue, serum, and it may have other composites.

Now, what are the reason and cause of the deposition of the white blood-corpuscle? It is always nervous shock; this through the vaso-motor system so modifies the condition of the muscular coats of the arterial vessels as to permit the migration of the white blood-corpuscles. This is inflammation through nervous shock. Now, having determined what the cause of pus is and whence it comes, we have only to determine what changes take place.

The experiments of Grawitz and a number of others prove that true pus can exist without the presence of micro-organisms. Grawitz introduced sealed glass tubes containing acids under the skin of animals, and after waiting for the inflammation from the insertion of the tubes to subside, he broke the tube and found, on subsequently opening down to them, pus, broken-down blood-corpuscles, and absolutely no micro-organisms.

Dr. BUTLER said that it was not necessary that the vascular walls should be expanded for the leucocytes to pass through them. The leucocytes can pass through any part of the body without any reference to the vascular system.

Dr. ESCHELMAN said that the assertion that inflammation led to pus-formation is true. It was like a city man in the country, who saw a farmer picking up apples from the ground under the trees, and remarking upon the quantity of apples produced from the ground, was told the ground did not produce the apples; they grew on the trees, which, however, grew from the ground.

Dr. M. H. FISH, of New Berlin, read a paper entitled "Why Not have County Dental Societies?"

The paper of Dr. Fish was a plea for the formation of county societies as a means for creating an interest among members of the profession with respect to professional matters. The county society, by its more frequent meetings and the closer relationships created thereby, was to be regarded as a more active agent in establishing a unity of feeling and action than could possibly be accomplished by other organizations.

The lack of true professional spirit, not only among many of the older practitioners, but among those who have just entered the profession, is a condition to be deplored, and one which, through organization through the medium of county societies, could be largely eliminated. Such societies would do much to correct the evils resulting from want of knowledge of professional ethics and relationships, by exerting a proper educational influence upon their members tending to dignity and higher manhood. The essayist quoted from the Cincinnati *Lancet-Clinic* of October 13, 1894, statements respecting the value and influence for good of county societies in the medical profession, and contended that like conditions prevailing in dentistry would be as fully benefited by the establishment and energetic working of similar organizations.

Dr. M. D. JEWELL, of Richfield Springs. The position taken by Dr. Fish, that any great amount of good is to be derived from county organizations, is one which, from my standpoint, I feel I should antagonize.

The idea of such an organization loses interest at once to me, on account of the *identical reason* the essayist has advanced as sufficient reason for bringing the subject up for discussion,—viz, "the average light attendance at our district meetings."

An experience extending over a period of thirteen to fifteen years in the work of sustaining interest in dental conventions has demonstrated to my satisfaction that the district society, as designed by the originators of our present system, was "builded wisely and well." So thorough is my conviction that the present system will amply meet our needs that I doubt the possibility of arousing the interest of delinquents by a further subdivision of our forces, and thereby multiplying our present difficulty.

As a matter of fact, county *medical* societies do exist; but if my personal knowledge of the proportion of physicians that take advantage of them is a criterion, there is little prospect of our bettering our condition by adopting the scheme of county organizations. Out of upwards of twenty physicians in the immediate circle of my acquaintances, but three or four are ever seen or heard of in the county medical society.

That local societies and frequent meetings are of immense advantage I have no doubt. Our great vantage-ground held by the First, Second, Fifth, Seventh, and Eighth District Societies of this state I firmly believe to be the opportunity for cultivation, and stimulus to the more active, aggressive work characteristic of those societies as compared with the Third, Fourth, and Sixth. This is largely due to the fact that the large towns and cities within their borders afford opportunity for frequent meetings at the local club and society, resulting in a consequent broadening and deepening of their views, thereby better qualifying them for the regular work of the annual and semi-annual meetings already provided for in a manner not possible to obtain in a county organization. While I recognize the benefit derived from a local society, it does not of necessity apply that a county organization would lighten the burden of state or district *business committees*.

I hold that the present system is ample for all our needs, if only those who now appreciate and enjoy its advantages would spend a portion of their reserve of vital force in doing a legitimate amount of missionary work among the unregenerate.

I fear the essayist has unconsciously sounded the key-note of our discontent in his allusion to the well-known fact that a goodly portion of those outside the fold are holders of certificates of qualification from *reputable* dental colleges.

It is matter for regret that this is so ; but where lies the difficulty? Is it not in the lack of proper teaching at the college? It is my firm belief that the dental college is in a measure responsible for this condition, and that it should be among the requirements for "recognition" that a dental college inculcate the need of "the assembling of ourselves together" as vital to true professional advancement. It was such teaching that sent me at once to my district society.

Therefore, basing my opinion upon a somewhat extended experience in the work, and upon what I believe to be a full realization of the needs of the profession, I must differ with the essayist, first as to the utility of county societies, and secondly as to the possibility of sustaining them if organized.

Dr. W. W. Coon, of Alfred Center, took exception to the remark that the country dentist could not attend the annual meetings, and that they should not make county societies because he did not live up to the standard of ethics required. He believed the county societies could be carried on without a code of ethics, and that the spirit of companionship which would be encouraged would lead many to conform to the code required by the district societies, and to become members of the same.

Dr. W. E. Magill, of Erie, Pa., thought there was a consciousness of the old spirit in regard to societies in the paper, which did not take into account the changes in the profession. Now we are in a transitional condition ; when the profession was younger more could be learned, and there was more need of the learning at society meetings than at this stage, when dental colleges abound and the professors are abroad in the land. Then dentistry was an art ; now it is a science, and there is more interest given to the acquirement of an art than to mastering a science. Then dentists went to society meetings to learn those methods of practice which are now taught in the schools, and they had no other opportunity to learn them. It now would be difficult to maintain the interest of members in county societies ; they prefer to attend district, state, or one of the great national associations. We used to feel the advantages of society meetings as educators, but now the colleges are the educational forces rather than the societies.

Adjourned.

## Second Day—*Morning Session.*

The convention was called to order at 9.30 A.M. ; Dr. W. V. Grove in the chair.

Dr. J. B. Willmott, of Toronto, Canada, read the following paper, entitled,—

## Partial Artificial Dentures a Menace to the Natural Teeth.

It will, I presume, be universally conceded that the first duty of the dental practitioner is to conserve the natural organs. In a very considerable percentage of cases, however, a further duty devolves upon him of replacing these organs when their loss has become inevitable. A pretty wide range of observation, and considerable attention paid to the matter, has convinced me that whenever a partial denture is inserted in the mouth of a patient, a new and active factor has been added to those already existent, tending to the destruction of the remaining teeth.

There are but few practitioners, of even limited experience, who have not observed the marked tendency to the development of caries on approximal and lingual surfaces of teeth in contact with artificial dentures, a tendency which has become more marked since the advent and almost universal adoption of plastic bases, hard vulcanite and celluloid.

The cause of this widespread condition is worth investigating. When the teeth are in the normal relation to one another, even when close together, there is more or less of a free space between the point of contact of the teeth and the septum of the gum, which is filled with moisture. During the greater portion of the time the mouth is a closed cavity, and every motion of the tongue, cheeks, and lips by pressure on the confined air causes a movement of this interstitial moisture, a movement which serves a very important purpose in inhibiting dental caries.

The accepted theory of dental caries assumes that the destruction of tooth-tissue is due to the action of the acid ptomaines of certain bacteria, the life-history of which constitutes the phenomena known as fermentation. The conditions favoring this particular form of fermentation are a lodgment of starchy or saccharine matter, the presence of moisture, heat, and an organized ferment, and perfect quiescence.

While the teeth are in normal relations to one another, quiescence of the interstitial moisture mixed with particles of food for long periods is impossible, so that the conditions most favorable to the development of fermentation are absent. The more free the dental interspaces the greater the movements of the fluids, and, as a consequence, the greater freedom from the conditions favorable to the development of fermentation, resulting in approximal surface caries.

All dentists have observed the comparative immunity from caries of teeth naturally well separated from one another. We have all noticed that the anterior lower teeth, when free from tartar, are much less liable to develop caries than other teeth in the mouth, a condition explainable from the fact that in normal conditions every movement of the tongue forces the saliva over their approximal surfaces, thus preventing the condition of stasis under which fermentation flourishes.

If this reasoning be correct—and we have no doubt on that score—then it follows that every departure from the normal condition and relations of the teeth in the mouth that interferes to any extent with the free movement of what may be termed the interdental moisture is a menace to the permanence of the natural teeth, and a very important factor in the development of approximal surface caries. The degree to which partial artificial dentures thus endanger the remaining teeth will depend, of course, very much on the skill and intelligence with which this operation is performed. How are partial dentures on plastic bases usually constructed? Take, for illustration, the insertion of two lateral incisors on what is termed a band or spring plate, a very common form. An accurate impression is taken of the remaining teeth and associate parts, and the vulcanite base-plate of the denture is constructed so as to cover from two-thirds to four-fifths of the palatal surfaces of the teeth as far back as the second molar. The denture fits beautifully into the interdental spaces ; the artificial laterals completely fill the spaces and rest closely on the approximal surfaces of the cuspids and centrals, the base coming well up on the palatal surfaces of these teeth. The denture is put in position and pronounced a perfect fit. What have we accomplished besides replacing substitutes for two lost teeth ? Simply this, that we have absolutely prevented any movement of the moisture in the interdental spaces so long as the denture is in position. In many cases these are removed but once in twenty-four hours, when the teeth are brushed on rising in the morning. As experiment has determined that starch and sugar lodged between the teeth are, by the processes previously referred to, converted into acids in a very few hours, we can well understand why, in a few months, the wearers of such dentures as I have described should be shocked to find that what they regarded as good cuspids, centrals, bicuspids, and molars had developed extensive caries. To the initiated there is no occasion for surprise. If this had been the result deliberately aimed at, no more certain means to that end could have been devised.

While the class of partial dentures used as an illustration is possibly the worst sinner, inasmuch as in proportion to the number of teeth inserted it closes more interspaces and covers more palatal surfaces than other forms, the frequency with which lost bicuspids are replaced on dentures which cover the palatal surfaces of all the other upper teeth, preventing all movement of the fluids in the interspaces of the incisors and cuspids, accounts for the development of vast numbers of approximal cavities in the anterior teeth.

Where crowns or bridges are inserted in such a manner as to impede or prevent the movement of the fluids over the approximal surfaces of adjoining teeth, similar results are produced. What is the remedy ?

We admit, of course, that partial dentures must be inserted. The only question is, How can the danger to the remaining teeth be reduced to a minimum ?

Probably the best course to pursue would be to abandon entirely the use of plastic bases for partial dentures, and substitute thin metallic bases, which will not close the dental interspaces or cover the palatal surfaces, at the same time exercising care that the tooth or teeth do not so closely fill the space as to prevent free wash over the exposed surfaces of the natural teeth, and depending for retention upon skillful clasping or on suction. With many patients the increased expense will make this method impossible. Even with plastic bases the evil may be enormously lessened. Where bicuspids or molars are replaced, what is known as a cut-off plate is an immense improvement on the ordinary forms.

Instead of reaching forward and resting on the palatal surfaces of the anterior teeth, it is cut from the cuspid on either side so as to expose in the median line from three-eighths to five-eighths of an inch of the mucous covering of the palatal surface of the mouth. Posteriorly it is cut away from the remaining teeth so as to only touch a small portion of one tooth on either side of the space to be filled. It is extended across the palate and retained by suction. There are great advantages in this form in addition to the greater immunity from caries which it insures. At no point in the mouth is a denture so much in the way as immediately behind the anterior teeth. This form leaves this portion uncovered. The special sense of taste is located in the tongue, and this function is much more perfectly performed when the tip of the tongue can be brought into contact with the mucous membrane of the anterior part of the palate. This is permitted by this form of plate. In cases where, of necessity, the plate must pass across the palatal surface of some natural teeth, as where a molar, first bicuspid, and central incisor are to be inserted, the intervening natural teeth being in position, the edge of the plate should be chamfered down till quite thin, so that the smallest portion of the palatal surface will be covered and the interspace left free. The backing of the artificial teeth should be beveled away from the natural tooth, so as to permit the free passage of fluids. In the insertion of Richmond crowns or Logan crowns care should be exercised that, especially at the central portion of the tooth, the artificial does not lie closely to the natural one. One further suggestion in conclusion. If there is any truth in our contention, it is evident that the longer a partial denture remains in the mouth without removal, the greater the danger of mischief.

Our patients who are so unfortunate as to be obliged to wear these partial dentures should always be instructed as to the danger to the remaining teeth, and the conditions so explained that they can understand the necessity for the exercise of great care. They should be told that it is important that, several times during the day, the denture should be removed and the mouth rinsed in such a manner as to force the water over the approximal surfaces, washing out the interspaces; and especially should this be attended to immediately before retiring, so that the incipient fermentation of the particles of food remaining from the last meal may be broken up, and not be permitted, as it otherwise would, to go on to completion under the conditions of quiescence which exist during sleep. Under no circumstances should partial dentures be worn during the night.

### *Discussion.*

Dr. S. B. PALMER, of Syracuse, said he would not discuss the paper, but would tell of his knowledge of the operation and how to avoid the threatened danger from personal experience.

In 1848 he made for himself a denture of nine teeth; they were clasped to a molar on either side. After forty-two years one of these supporting teeth was lost,—not worn or decayed, but the root was absorbed; the other one wore tapering, and three years ago it was crowned, and is still firm and supports a plate. As these teeth had no antagonists they elongated, but did not decay from contact with the clasps. The plate was frequently removed and cleansed. This should always be recommended strongly, and the clasps should either have a lug extending over the masticating surface of the tooth, or be in the form of a partial cap, which will relieve the pressure of the plate on the gum-tissues and tend to prevent the elongation of the teeth.

Gold clasps to retain partial dentures should not fit so closely that the fluids of the mouth cannot pass between the clasps and the teeth, for being confined thus the particles of food will gather, and, being undisturbed by the movement of the fluids, will decompose and ferment, causing decay. With due attention to these principles and with frequent cleansing, the destruction of natural teeth by clasps will be very inconsiderable.

Dr. W. E. MARSHALL, of Buffalo, thought the trouble with partial dentures often arose from the fact that too much dependence was placed on the clasp, and not enough care was given to make the plate fit. As much care should be exercised to get a perfect fit as if it were a full plate, and it should be made so that it will be retained in position without the support of the other teeth.

Dr. W. E. MAGILL, of Erie, Pa., agreed with the principles laid down in the paper, and said the plate should be so shaped and arranged that the clasp should be tight and embrace the crown and not the neck of the tooth, as the neck is where decay is most likely to occur. He described a method of inserting a screw in a tooth for the purpose of holding the clasp in place, the clasp fitting over the screw.

Dr. W. C. BARRETT, of Buffalo, said he thought very few dentists could fit a clasp so closely as to prevent the movement of fluids under it.

(To be continued.)

## CHESTER AND DELAWARE COUNTIES DENTAL SOCIETY.

THE Chester and Delaware Counties Dental Society completed its organization and adopted a constitution and code of ethics, the last based on the code of the State Society, on January 23, 1895, at a meeting held in Media, Delaware county.

The following were elected officers for the year: Dr. S. B. Luckie, of Chester, president; Dr. James L. Paiste, of Avondale, vice-president; Dr. Meta Tudor Haley, of West Chester, secretary; Dr. Harry L. Smedley, of Media, treasurer. The Executive Committee consists of the officers as named above, and three elected members, as follows: Dr. F. Barnard, of Kennett Square; Dr. C. H. McCowan, of West Chester; and Dr. J. R. C. Ward, of Wayne.

Three meetings will be held each year, on the fourth Wednesdays of January, April, and October. A feature of these meetings, in addition to the discussion of professional matters, will be a dinner, for the purpose of increasing the social feeling and good-fellowship of the members.

The next meeting will be held at West Chester, April 24, 1895, at 2 o'clock P.M.

## ST. LOUIS DENTAL SOCIETY.

THE St. Louis Dental Society has elected as officers for 1895:

Dr. Walter M. Bartlett, president; Dr. M. R. Windhorst, vice-president; Dr. F. F. Fletcher, corresponding secretary; Dr. P. H. Morrison, recording secretary; Dr. A. J. Prosser, treasurer; Drs. L. A. Young, P. H. Eistoeffel, and T. L. Pepperling, publication committee; Drs. Wm. N Morrison, P. F. Helmuth, and O. H. Manhard, committee on ethics.

F. F. FLETCHER, *Corresponding Secretary.*

## SOCIEDAD ODONTOLOGICA ESPAÑOLA.

THE "Sociedad Odontologica Española" was formed recently in Madrid, Spain.

The initiatory steps toward the formation of this society were taken by the three Spanish dental publications, *La Odontologia*, *La Revista Estomatologica*, and *El Progreso Dental*, by repeated articles urging the professors at Madrid to unite in placing the corner-stone of a constitution of a national association; a scientific body whose duty should be to increase and diffuse professional knowledge, to unite the profession, and strengthen the bond of fraternity which should exist between individuals practicing the same profession.

To this end numerous dentists of Madrid, in meeting assembled, organized, and named Mr. Portuondo president, he being eminently qualified by reason of his being chairman of the commission named to urge the government to enact a reform in dental education. Mr. Garcia Velez was named as secretary. Dr. Aguilar explained the objects of the meeting, and after discussing the best means of organization, etc., the following officers were elected: Ramón Portuondo, president; Harry Highland, first vice-president; Florestan Aguilar, secretary general; Carlos Garcia Velez, recording secretary; Enrique Headdy, treasurer. It was agreed that Dr. Aguilar should prepare and present a set of by-laws.

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# DENTAL SOCIETY ANNOUNCEMENTS.

## THE HORACE WELLS PERMANENT MEMORIAL.

### UNDER THE AUSPICES OF THE AMERICAN DENTAL ASSOCIATION.

*To the Dental Profession of America:*

The Central Executive Committee appointed by the president of the American Dental Association is as follows: Dr. James Truman, Dr. Wilbur F. Litch, Dr. S. H. Guilford, Dr. E. C. Kirk, Dr. J. D. Thomas, chairman and treasurer.

This committee has been completed in its organization by including in its membership the presidents of all dental societies throughout the United States.

It is hoped to secure enough money to erect a bronze statue of Horace Wells in the national capital. The details as the style and character of the statue, as well as its definite location, will be decided upon at the next meeting of the American Dental Association, to be held at Asbury Park, N. J.

The committee takes pleasure in calling your attention to this opportunity for doing an act of justice to the memory of a worthy member of our profession, whose discovery has been of such incalculable benefit to humanity, and which has been so great an honor to our profession. You are invited to contribute whatever amount of money you may feel able and willing to donate to the fund, and to use your influence toward bringing our plan to a successful issue in a manner befitting the object.

Contributions may be sent by any member of the profession through the president of his local society, or direct to the treasurer, Dr. J. D. Thomas, 912 Walnut street, Philadelphia. An official receipt will be issued by the treasurer for all contributions. The full list of contributors will be embodied in the pedestal of the memorial.

J. D. Thomas,
*Chairman of the Central Executive Committee.*

The Executive Committee requests that all who desire copies of the souvenir volume of the meeting held at Philadelphia December 11, 1894, in celebration of the fiftieth anniversary of the discovery of anesthesia by Horace Wells, will promptly forward their names to the chairman, in order that the number of copies to be printed may be determined upon. The price has been fixed at $1.50 per volume, postage free to all parts of the United States; foreign countries at regular postal rates.

## VERMONT STATE DENTAL SOCIETY.

The nineteenth annual meeting of the Vermont State Dental Society will be held at Brandon, March 20 to 22, 1895.

Reduced rates on railroads and at the hotels have been obtained. Some of the best operators have been engaged, and we expect to have a very interesting meeting.

A cordial invitation is extended to all members of the profession.

Thomas Mound, *Secretary,*
Rutland, Vt.

## CLINIC OF THE FIRST DISTRICT DENTAL SOCIETY.

An all-day clinic will be held under the auspices of the First District Dental Society of the State of New York on Tuesday, March 12, 1895, at the New York College of Dentistry, 205 East Twenty-third street, New York city.

A cordial invitation is extended to all members of the profession to be present. Any one desiring to clinic or exhibit anything of value is requested to communicate with the committee.

James G. Palmer, *Chairman Clinic Committee,*
18 W. Thirty-fifth street, New York city.

## TEXAS DENTAL ASSOCIATION.

The next annual meeting of the Texas Dental Association will convene at Houston, May 22, 1895, and be in session for three days. This being the same time as the reunion of the Ex-Confederate Veterans, a cheap transportation rate is assured. It is specially desired that this be the most successful meeting in the history of the association, and a large attendance is anticipated. A cordial invitation to the profession generally is extended.

J. G. Fife, *Secretary and Treasurer,*
Dallas, Texas.

## TRI-STATE MEETING.

THE Russell House, Detroit, has been selected as headquarters for the joint meeting of the state societies of Michigan, Ohio, and Indiana, which will occur June 18, 19, 20, 1895. The clinics and literary sessions will be held in the Dental Department of the Detroit College of Medicine and Surgery.

## NORTH CAROLINA STATE DENTAL SOCIETY.

THE twenty-first annual meeting of the North Carolina State Dental Society will be held in the city of Salisbury, N. C., on May 14, 15, 16, 1895.

A cordial invitation is extended to members of the profession.

The State Board of Dental Examiners will meet at the same time and place to examine all applicants for license to practice in the state.

J. E. WYCHE, *Secretary*, Greensboro, N. C.

## MISSISSIPPI VALLEY DENTAL ASSOCIATION.

THE fiftieth annual meeting of the Mississippi Valley Dental Association will be held in Cincinnati, April 17 and 18, 1895. J. TAFT, *President.*

J. R. CALLAHAN, *Chairman Executive Committee*,
97 W. Eighth Street, Cincinnati, O.

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# EDITORIAL.

## IN RE COAGULANTS.

IN this issue we publish Dr. Harlan's reasons for his assertion respecting coagulants that "they coagulate the organic surface with which they come in contact and prevent their own diffusion."

It is quite evident from the paper itself, and in the discussion which followed its reading before the union meeting in New York, that the main problem has not by any means been strictly adhered to.

The point of contention is not the relative value of medicaments in the treatment of pulpless teeth ; but, Are coagulants when used for such purpose self-limiting in their action, and do they set up impenetrable barriers to the diffusion of other antiseptics?

A further confusion of the issue has arisen through the tendency to regard tests addressed to a solution of the question as being inconsequent or valueless when made out of the mouth. Such a view, it would seem, could only originate in a failure to understand the significance of such tests, and the nature of the conditions surrounding them.

It is to be regretted that the discussion of this matter has been allowed to extend so far beyond the limits of the original problem,—not because all of its collateral and subsidiary problems are not of the utmost practical value, but because in order to arrive at the truth it is most desirable, even essential, that the fundamental factor be solidly established upon a basis of truth before the related questions are taken up for investigation and settlement.

It is a source of gratification to us that Dr. Harlan has so fully set forth his reasons for the faith that is in him with respect to his assertion that coagula are impenetrable by antiseptics. He leaves no room for doubt as to his belief in this position. The issue is clearly stated, and thus leaves the subject open for further discussion.

Believing that more detailed investigation cannot fail to so elucidate the problem that we may arrive at conclusions which will receive general acceptance by the profession, we propose to continue our researches in this matter to that end. We would suggest to Dr. Harlan that he pursue a similar course, unless he deems his latest exhibit in this line to be final and conclusive. In the mean time, and pending the prosecution of the work necessarily incident to such a research, the question as to the penetrability of coagula by antiseptics is open, and we invite a free discussion of it on the evidence thus far submitted. We shall be glad to publish any testimony from members of the dental profession bearing on the subject.

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## THE DISCOVERY OF ANESTHESIA.

"The *British Medical Journal* for January 5 contains the following paragraph:

"'A tablet of bronze, to the memory of Dr. Horace Wells, of Hartford, Conn., was unveiled on December 11, 1894, in commemoration of the fiftieth anniversary of the discovery of nitrous oxid as an anesthetic. On December 11, 1844, Dr. John M. Riggs, at Wells's request, administered nitrous oxid to him and extracted a tooth under the influence of the gas without causing him any pain. The tablet bears a medallion portrait of Horace Wells, with the following inscription: "To the memory of Horace Wells, the dentist, who upon this spot, December 11, 1844, submitted to a surgical operation, discovered, demonstrated, and proclaimed the blessings of anesthesia."'

"We cannot help feeling that anything can only once be discovered, and that the one who has priority in publication is the one entitled to the discovery, and in this respect we still maintain that *Sir Horace Davey* was the discoverer of the anesthetic properties of nitrous oxid, and not Horace Wells."

We clip the foregoing, minus the italics, from the *Journal of the British Dental Association* of January 15, 1895. We think our esteemed contemporary is wide of the mark in feeling that "anything can only once be discovered," as the record of human experience is full of examples pointing to the contrary.

Nobody can doubt that Sir Humphry Davy knew of the power of nitrous oxid to annul pain, and that he published his observation to that effect. Notwithstanding this, however, the world waited nearly fifty years for Horace Wells to proclaim anesthesia in terms that could be understood, so that humanity could utilize the discovery.

Sir Humphry Davy and Horace Wells are each entitled to a share in the honor of the discovery, and we believe the greater credit is due to the latter, because it was he that practically gave anesthesia to the world.

Perhaps it was an adumbration of this view of the case which led the worthy editor of the *Journal of the British Dental Association* to credit the discovery to "Sir Horace Davey," after the manner detailed by the late Mr. Lewis Carroll in his preface to "The Hunting of the Snark."

## ADDED PAGES.

SIXTEEN additional pages of reading-matter are furnished with the present number, notwithstanding which we are compelled to omit several original communications and reports of societies already in type, which will appear in our next issue.

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## BIBLIOGRAPHICAL.

THE ANGLE SYSTEM OF REGULATION AND RETENTION OF THE TEETH, AND TREATMENT OF FRACTURES OF THE MAXILLÆ. Fourth edition, revised and enlarged, with one hundred and thirteen illustrations. By EDWARD H. ANGLE, D.D.S., former Professor of Histology, Orthodontia, and Comparative Anatomy of the Teeth in the Dental Department of the University of Minnesota; Professor of Orthodontia in the American College of Dental Surgery, Chicago, Ill.; Surgeon to the Asbury Hospital in Minneapolis, Minn., and Surgeon for the Treatment of Fractures of the Maxillæ to the Great Northern Railway. Philadelphia, The S. S. White Dental Mfg. Co., 1895. Price, paper, 75 cents; cloth, $1.00.

The author of this little work believes, and has proven, at least in his own practice, "that it is not only possible, but practicable, to systematize, classify, and provide ready-made regulating appliances, reducing them to a few simple forms to meet by their combinations the requirements in all varieties of cases susceptible of treatment." He sets forth explicitly the details of his method, the technique of the manufacture and application of the fixtures which he has devised, and explains and illustrates by cases from his practice the actual working and results of his system.

Those who have investigated the Angle system of treating cases of irregularity have fully admitted the claims which the author makes for its simplicity and effectiveness. The book is one with which all dentists should be familiar, and especially those who regard orthodontia as an intricate, unsatisfactory, and profitless department of dental practice.

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# OBITUARY.

## DR. ROBERT A. SHEPPARD.

DIED, at Newton, N. J., January 19, 1895, of paralysis, ROBERT ALEXANDER SHEPPARD, D.D.S., in the sixty-eighth year of his age.

Dr. Sheppard was born on the old Sheppard homestead farm, in Hunterdon county, near Flemington, N. J., April 2, 1827. On his mother's side he was a lineal descendant of Patrick Henry, of Revolutionary renown, his grandmother being a daughter of the famous orator and patriot. Upon reaching his majority he quit farm-life and commenced the study of dentistry with Dr. J. P. Truex, of Baltimore, Md., with whom he remained two years, during which time he attended two courses of lectures at the Baltimore College of Dental Surgery, from which he was graduated in 1850. Immediately after graduation he commenced practice at Mauch Chunk, Pa., where he remained six months. He practiced also for a few months in Schuylkill Haven and Hackettstown. In June, 1852, however, he went to Newton, N. J., where his skill as a dentist soon secured him a large patronage throughout Sussex county, which he continued to hold for over thirty years.

Not only was Dr. Sheppard prominent as a dentist, but he possessed that public spirit and financial ability which leads on to fortune, and he died a wealthy man. He was a director of two Newton banks; was twice elected county collector, in 1873 and 1878; was one of the railroad commissioners of New Jersey from 1884 to 1887; was a judge of the Court of Common Pleas for the term ending in 1892, and was otherwise well known politically and socially throughout the community, in which he was regarded as a man of great ability and integrity of character.

Dr. Sheppard was married three times,—first, in 1851, to Elizabeth A. Holcomb, of Flemington, N. J., who died in 1855, leaving a son and daughter; secondly, in 1858, to Sarah C. Cochran, who died in 1868, leaving one daughter; thirdly, in 1872, to Mary Cochran, a sister of his second wife, who died in 1890, and by whom he had two sons.

The funeral was largely attended by the relatives and friends of the deceased, and also by the representative business men of Newton. The remains were interred in the family burial-plot in the Newton cemetery.

## DR. A. O'DANIEL.

Died, at Goldsboro, N. C., January 8, 1895, of heart-failure, A. O'Daniel, D.D.S., in the thirty-third year of his age.

Dr. O'Daniel's illness was of brief duration, he having been stricken down only about two weeks before his death. He was born in Duplin county, North Carolina, June 14, 1862. He was a graduate of the Baltimore College of Dental Surgery, of the class of 1884, and immediately thereafter entered practice at Goldsboro, which continued up to the time of his decease. He was a member of the North Carolina State Dental Association. He was an upright and intelligent man, a good dentist, and his early death is much regretted. In November, 1887, Dr. O'Daniel was married to Miss Elizabeth Allen Smith, who survives him, with one child.

## DR. WM. H. HOOPES.

William Haines Hoopes, D.D.S., died at his home, 308 North Eutaw street, Baltimore, Md., January 30, 1895. He was taken suddenly ill, suffered but little after the first night, was unconscious most of the time, and died within a week, of Bright's disease.

Dr. Hoopes was born in Chester county, Pa., January 18, 1835. He was a descendant of Joshua Hoopes, who settled in Pennsylvania in 1683. He began his dental pupilage under Drs. Chandler and Townsend, in 1852, in Baltimore, graduated at the Baltimore College of Dental Surgery in March, 1856, and at once entered the practice of dentistry in the city of Baltimore. He loved and zealously practiced his profession; enjoyed a wide reputation and one of the largest practices in the city of Baltimore for many years.

He entered his professional career when dentistry was in its infancy, yet he kept abreast with the rapid advance. He was preceptor to a number of dental students, and a member of several dental societies.

Dr. Hoopes married Miss Georgianna Wilhelm, of Baltimore, in June, 1857. He was a model husband and father. His wife died in November, 1884, and the following-named seven children survive: Miss Fannie E. Hoopes, D.D.S., M.D., Miss Mary Ella, Samuel W. Hoopes, D.D.S., Mrs. D. C. Walker, Miss Blanch L., Arthur, and Miss Gertrude G.

He was a member of the Society of Friends, belonged to the order of Masons, and was a director of the Maryland Academy of Sciences.

He was a faithful friend, a peacemaker, kind, noble, true. He was jovial, in general good health and active practice up to the time of his last illness.

B. M. W.

## HINTS, QUERIES, AND COMMENTS.

Sodium Peroxid.—I am indebted to Dr. William H. Trueman for a suggestion which has been of very much value to me in the preparation of the sodium peroxid solution. Dr. Trueman advises that the inner soldered lid of the can in which sodium peroxid is dispensed be perforated by means of a fine engine drill with a number of small holes, somewhat like the lid of a pepper caster. By means of this device the powdered peroxid may be gradually sifted into the cold water in making the solution. By replacing the outer screw-cap lid the contents of the can do not undergo change by absorption of atmospheric moisture, as is quite likely to be the case where the soldered inner cap is removed to gain access to the material.—EDWARD C. KIRK.

To THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—I notice on pages 163 and 164 a short extract from "Chambers's Encyclopedia" signed "C. Fischer, chemist." This extract refers to the oxidation of gutta-percha. Now, sir, if the DENTAL COSMOS desires to spread abroad such nonsense as that quotation for science, it can do so, of course; but I would not publish popular science for exact science. If you will look at page 281, Vol. II, of the "Dictionary of Applied Science," edited by T. E. Thorpe, you will find: "Oxidation occurs with greatest vigor when gutta-percha is exposed to a temperature of 25° to 30° C. (77° F. to 86° F.), and when subject to strong sunlight, Dr. Miller finding that when the coating of telegraph wires and submarine cables had been protected from the light, no sensible deterioration had taken place." Gutta-percha in a root of a tooth is protected from sunlight, and it has a constant temperature of about 98° F.

Yours truly,

A. W. HARLAN.

To THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—In your issue of September, 1894, you report the proceedings of the thirty-fourth annual session of the American Dental Association, held at Old Point Comfort, Va., on August 7, 1894.

In the remarks made by Dr. W. St. George Elliott, viz.,—

> "Dr. W. St. George Elliott described a method of vulcanizing rubber between metal surfaces which had been introduced into England within the last few months by Mr. Humby. It is in fact an adaptation of steam-swaging, and the idea was not original with Mr. Humby, having been used in manufacturing vessels of thin metal. The apparatus resembles somewhat a small vulcanizer, the upper part of which is in the form of a hemisphere, the lower part a cylinder. The model is placed in the upper hemisphere, which at its highest point has a hole to communicate with the atmosphere. The parts are then screwed together, and heat is generated, producing a pressure of one hundred and twenty pounds. As soon as the metal is blown up by the force of the steam, it blows out through the orifice. The utility of the process is practically confined to thin metals, but it has been used successfully in swaging vulcanite plates. It has the advantages of extreme rapidity, the rubber is of equal thickness, and the rugæ are well copied. It makes an excellent trial plate."

He is in error when he stated that the idea was not original with Mr. Humby. A patent was obtained for a steam swager by W. R. Humby and H. Rose on May 12, 1874, for England, and shortly after was introduced to the profession through the medium of the *Dental Journal*. I think it only right that the true facts of the case should be made known, as it might mislead your numerous readers.

W. R. HUMBY, C.S.

88 NEWGATE STREET, LONDON, E. C., January 25, 1895.

A Simple and Rapid Method of Banding the Logan Crown without the Use of Solder to Attach Crown to Band.—To simplify matters we will suppose we are to band a superior central incisor.

Prepare the root to be crowned as for any band crown. Make a band of twenty-two carat, 29-gauge gold plate to fit the root of the tooth. This band should be decidedly larger at one end than at the other, the small end fitting the root, and being wider on the lingual or palatal side (Fig. 1). Drive the band on the root, and mark on the inside all around, the distance the root comes up into the band. Remove the band from the root, and burn into a block of wood up to the mark where the root stops (Figs. 2 and 3). Drill a hole in the wood in the center of the band, so as to allow the crown pin to penetrate the wood (A, Fig. 4). Select a Logan crown, grind and align it in the mouth, remove the crown and force it into the band which remains in the wood, reducing the circumference of crown, if necessary, by grinding. Place in the improved Hollingsworth crown contour press, and force the crown into the band until it strikes the wood (Fig. 5). Now with a heavy burnisher burnish the band to the palatal surface of the crown, clear over the palatal curvature (Fig. 5).

FIG. 1.

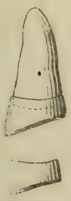


FIG. 2.

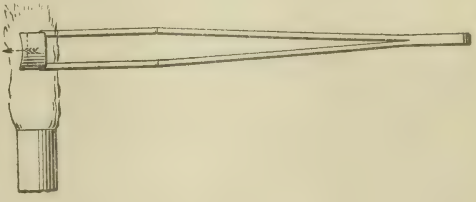


FIG. 3.

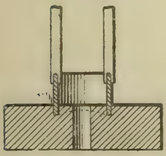


FIG. 4.

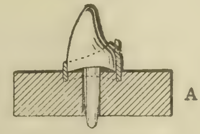


FIG. 5.

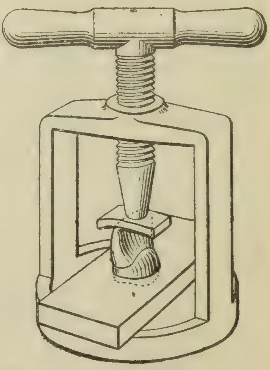


FIG. 6.

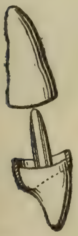


FIG. 7.

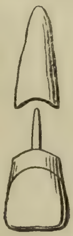


FIG. 8.

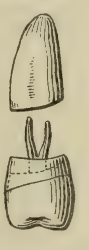
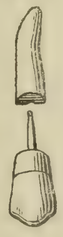


FIG. 9.



Remove the band and crown from the wood, and you will find they are fast together (Figs. 6 and 7). Trim the band to a feather edge with corundum stones, always grinding toward the cutting-edge of the crown, and leaving the band wide on the approximal surface and narrow as desired on the labial surface. If these rules be followed, the band will be so tight on the crown as to make its removal a matter of difficulty. Figs. 8 and 9 are bicuspids done in the same way.—Thomas P. Hinman, D.D.S., Atlanta, Ga.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

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The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.

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# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING JANUARY, 1895.

*January 1.*—No. 531,795, to W. F. Green. Dental mouth-mirror.
" " No. 531,802, to H. F. Libby. Rubber-dam clamp.
" " No. 531,833, to G. L. Bruce. Dental matrix.
" *15.*—No. 532,676, to E. H. Lovejoy. Portable dental chair.
" " No. 532,681, to J. H. Meyer. Dental furnace.
" " No. 532,720, to J. W. Dennis. Dental plugger.
" " No. 532,721, to J. W. Dennis. Dental plugger.
" " No. 532,722, to J. W. Dennis. Dental matrix.
" " No. 532,723, to J. W. Dennis. Dental clamp.
" " No. 532,724, to J. W. Dennis. Filling for teeth.
" " No. 532,725, to J. W. Dennis. Filling teeth.
*22.*—No. 533,023, to E. G. Smith. Dental bridge-work.
" *29.*—No. 533,073, to L. T. E. Methot. Dental engine.
" " No. 533,195, to A. P. Hayes. Dentists' crown-swaging apparatus.
" " No. 533,318, to W. J. Pohlman. Controller or switch for electric motors.
" " No. 23,963, to J. S. Sanger. Design for tooth-powder holder.

THE

DENTAL COSMOS.

VOL. XXXVII. PHILADELPHIA, APRIL, 1895. No. 4.

# ORIGINAL COMMUNICATIONS.

## THE INFLUENCE OF PREGNANCY UPON DENTAL CARIES.

BY REUBEN PETERSON, M.D., GRAND RAPIDS, MICH.

FELLOW AMERICAN ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS.

(Read by invitation before the Grand Rapids Dental Society, February 13, 1895.)

ARE the teeth more liable to become carious during pregnancy? It will be noticed that I begin this paper, which I have had the honor of being asked to prepare for your society, with a question. This is appropriate, for it is in this spirit that I desire to bring the subject before you. As it has not been within my province to make a critical examination of teeth affected with caries, it is evident that I must depend for my facts in regard to this disease upon the members of the dental profession. I find that the literature upon this subject is voluminous, and that not only has its course been accurately described, but also that many important discoveries have been made during the past few years which tend to make its etiology more clear.

I find also that the condition of pregnancy has been most carefully studied and all its phenomena thoroughly discussed. But when I endeavor to discover some recorded observations upon the subject which will occupy our attention this evening, I meet with a disappointment, for, although I have carefully searched both the "Index Catalogue" and the "Index Medicus," I can find but little that has been written upon the relationship existing between pregnancy and dental caries. What little I have discovered has been in the form of short sentences, scattered through the different articles, and especially aggravating because of their brevity and assumption of the reality of certain conditions which are far from being proved. This proof must be furnished by the dental surgeons and not by general practitioners; and if I shall by this paper arouse you to an increasing interest in caries affecting the pregnant female, so that you may discover some of the missing links in the chain of evidence, I shall feel more than satisfied.

There is little reason to question the probable correctness of the opinion generally held, that the teeth are more liable to become carious during pregnancy. I am unable, however, to find any collected statistics upon the subject. I do not see why such observations should not be made and recorded, and the question settled beyond dispute. Surely, if an accurate history be taken of patients who seek your advice because of caries rapidly developing during the pregnant condition, you soon would be possessed of sufficient data to scientifically demonstrate the truth of the opinion which is almost universally held. But inasmuch as I am unable to find such records, I must assume, at least for the purpose of this paper, that pregnancy does have some influence in the production of dental caries.

The attempt to explain the nature of this influence is the task that is imposed upon me this evening. And in order that this may be done in an intelligent manner, I must ask that you bear with me while I briefly outline the salient features of dental caries, at the same time excusing any inaccuracies in one who must necessarily glean his facts from the literature of the subject, and not from daily observations of clinical material.

To the general practitioner, and especially to the surgeon, nothing can be more proven than the chemico-parisitic theory of caries, of which Dr. Miller, of Berlin, is the principal exponent. This careful investigator has applied the rules laid down by Koch for the study of pathogenic organisms, and has demonstrated that under certain conditions there exists in the human mouth a living ferment capable of self-reproduction (Robert Ormiston, M.D., DENTAL COSMOS, vol. XXX, 1889); that this ferment produces an acid at the point of contact with the tooth, capable of dissolving lime-salts. It was also shown that this was lactic acid, and that the micro-organisms were anaërobic, and therefore could live and thrive deep down in the carious mass. (G. V. Black, "American System of Dentistry," vol. i, page 761.) In some fissure of the enamel not washed by the saliva, and thus giving a chance for the lodgment of food, the micro-organism begins its work. The acid is produced and the hard enamel decalcified, and the softer dentine within exposed. By means of the dentinal tubules the micro-organisms gain an easy access to the interior of the dentine. The tubules are packed full, and more lactic acid is produced and more decalcification follows, until the carious cavity is produced. Because of the ramification of the tubules just beneath the enamel, there is a marked tendency to decalcification from the action of an acid devoid of the presence of micro-organisms. The fact that the tubules are not widened is one among other proofs which go to show that bacteria are at the bottom of the carious process.

This, in brief, is the modern theory of dental caries. It relegates to the past all the other theories, which had for their foundation a purely chemical basis, or sought to explain the phenomena through the agency of a vital process having its origin within the pulp-cavity.

This being the case, how are we to explain our first proposition,—namely, that pregnancy exerts a marked influence upon caries of the teeth? It is evident that the increased frequency with which caries is met with in pregnant patients must be due:

1. To influences which make themselves felt primarily upon the interior of the tooth; or

2. To influences acting primarily upon the external surfaces of the tooth ; or

3. To influences which are directed at the same time both upon the external and internal surfaces.

*1. Influences which make themselves felt primarily upon the interior of the tooth.*

I shall not weary you with any description of the theories which have been advanced to explain the etiology of dental caries, all of them based upon the idea that it was inflammatory in its nature and started from within. I shall simply examine two of the theories which are advanced at the present day to explain the cause of dental caries occurring during pregnancy. The first is one most commonly accepted as the explanation of the phenomena we are considering. It is, that the lime-salts are abstracted from the tooth in order to supply the demands of the growing fetus. I am unable to see why such a theory should be so universally accepted, for I am unable to find one scientific fact which can be brought forward in its support. In the absence of any microscopical examinations of the teeth during pregnancy for the purpose of ascertaining if an absorption of lime-salts is taking place, we are forced to consider the question more or less theoretically. If I am correct in my histology, the teeth are not supplied with any system of absorbents whereby the lime-salts can be abstracted for the purposes named. (Barrett, *Dental Practitioner*, vol. xxiv, April, 1893.) How, then, are they to be carried to the fetus from the tooth? The absence of any conveyance is certainly a serious drawback to any theory of the transportation of lime-salts.

For evident reasons, the teeth, of all the tissues in the body, are least liable to undergo the changes dependent upon nutrition. If this were not so, a few months of low diet would leave the hungry person without suitable teeth to masticate the much-desired food when obtained. If it were necessary to rob Peter to pay Paul, and abstract from the osseous system of the mother enough lime-salts to supply the needs of the fetus, why should the teeth be chosen? Why should not the bones, which are supplied with absorbent vessels, be selected for the sacrifice? But there are no evidences that these latter are affected in the way it is claimed the teeth are.

The endeavor has been made to show an analogy between osteomalacia and dental caries. At the first glance the two diseases have points of similarity. Pregnancy exerts a marked influence over both, the majority of cases of osteomalacia occurring during gestation. In both there is a loss of lime-salts. But microscopic examination of diseased structures in osteomalacia has shown that at some stages it is a true inflammation, which cannot be said of caries. Dr. George Dock, in a case of the former reported before the American Association of Physicians (Transactions, 1894), says that the bacteriological origin of the disease must be given up, as it is without foundation. His explanation of the cause is that it is a tropho-neurosis. In a private communication he states that the difference in the two diseases lies in the fact that dental caries is due to the action of micro-organisms, while some other explanation must be sought for the origin of osteomalacia. I fail, moreover, to find any mention of the teeth being affected in the latter disease. I think, however, that there is another condition present in both diseases which is etiologically very important. I shall mention this later on.

The theory which has been advanced to explain the supposed withdrawal of the lime-salts from the tooth is, that just enough phosphates are taken into the system during pregnancy to supply the needs of the fetus, and that the natural waste of lime-salts of the tooth is not replaced, and hence the tooth suffers in the loss of its inorganic elements. This, to my mind, is a much more plausible theory than the first one considered, in that it does not deliberately make a freebooter of Dame Nature in charging her with robbing the tooth of its stored-up treasure. There is probably more or less waste and repair going on in the tooth all the time, and in the absence of known facts regarding the quantity of these products, it would be within the range of possibility for the tooth to become impoverished were the supply of phosphates not sufficient. But here is the weak point in the theory. I find the following statement in the editorial article quoted above (Barrett, *Dental Practitioner*, vol. xxiv, April, 1893), the accuracy of which I cannot vouch for, as the references are not given: "The following computation has been made: If rice flour, which contains as little of the phosphates as any other common food, were the sole nutrition of a pregnant woman, and if she consumed barely enough to maintain a healthy existence, she might obtain from that alone double the amount that would be needed for herself and the growing child. It is well known that women always excrete phosphates during gestation." That the mother's organism is sufficiently supplied with lime-salts during pregnancy, it would seem as if there were normally the excess mentioned above, if we consider that osteophytes are found in the inner surfaces of the calvaria and even in the pelvic bones. They have been found to exist in over one-half the cases of women dying after the fifth month of pregnancy. (Jaggard, Am. Sys. Obst., vol. i, p. 350.)

2. *Influences acting primarily upon the external surfaces of the teeth.*

I believe that it is much more rational to endeavor to explain the influences of pregnancy upon dental caries by directing our study to the changes in the secretions of the oral cavity which may arise during gestation. If we can show that these secretions become more acid during this period, we will have made a considerable advance in our investigation of the subject under consideration. For acid secretions will evidently furnish the most assistance to the entrance of the micro-organisms into the interior of the teeth, by causing a decalcification of the enamel, or furnishing a soil suitable to the rapid development of the bacteria. I am unable to find that the oral secretions have been tested in relation to their acidity during the pregnant condition. Such a series of examinations should be made, and would prove of great value in solving the problem before us. But there is considerable probability that such a condition does exist. We must look to the changes in the blood for an explanation of the phenomena. These changes have been carefully studied and are well known to you all, and need not be enumerated. There is every reason to believe, however, that besides the increase in white corpuscles, fibrin, and water, there is a decided diminution in the alkalinity of the blood. In an important article ("Lithiasis in Pregnancy," *Jour. Am. Med. Asso.*, 1887, vol. ix, No. 23), Dr. J. E. Kelly seeks to ascribe this condition of the blood to the influence of lithemia upon the maternal organism. The similarity between the symptoms produced by the lithemic condition and those accompanying pregnancy are certainly striking, and have been set forth by the writer in a masterly manner. Of so much importance do I consider this article, as offering an explanation of the increased acidity of the secretions of the mouth, that I will quote the last paragraph of the paper entire: "As in the *résumé* of lithiasis, I wish to recall the persistent effects upon the system caused by the occurrence of a single pregnancy which, manifesting themselves by various lesions not to be ascribed to any other influence, and indicating the permanent adoption by the constitution of a morbid action, which must be regarded as being closely related to lithiasis. In endeavoring to establish a parallel, if not an identity, between the constitutional tendency produced by lithiasis and pregnancy, I have indicated that both originate in a grave disturbance of nutrition; they present a similar modification of the blood; the pathological changes bear a close resemblance; the prominent functional disturbances are broadly identical; the numerous sequelæ are similar; and lastly, after one or more visitations, the constitution is prone to adopt the induced condition as a diathesis."

The disease gingivitis is well known to you all. Here it is a well-proven fact that the saliva is extremely acid. I understand also that this disease is more prevalent, and of greater severity, in persons of a rheumatic or gouty diathesis. These diseases are characterized by excess of uric acid in the system and a diminution of alkalinity of the blood.

It is here that I would call attention once more to osteomalacia. Senator, in speaking of this disease (Ziemssen's Cyclopedia, vol. xvi, p. 221), says, "It (diminished alkalinity of the blood) might result from the hyperæmic state of the marrow of the bones, which (as I have pointed out in speaking of rickets) may resemble the splenic tissue to which it is closely allied, in being proved to generate an excess of certain organic acids when in a state of irritation (*e.g.*, in leukemia.)" It is agreed that pregnancy is an essential factor in the production of this disease, although the exact manner in which it acts has not been discovered. It is not too much to expect that further investigations will throw more light upon this very obscure subject, and possibly aid us in understanding why there is a diminished alkalinity of the blood and an increase of the acid secretions during gestation. I doubt very much whether this position is tenable. It is probable that the acid by itself is too weak to act upon the enamel, and could only therefore aid by rendering the saliva still more acid, and more favorable to the subsequent action of the micro-organisms. Nature has taken precautions to guard the teeth against the temporary action of acids, by causing an increased flow of alkaline saliva, which neutralizes or washes away the acid which has entered the oral cavity. If it were not for this provision, the teeth would necessarily suffer more than they now do. If it be true, as we suspect, that the saliva in pregnancy is abnormally acid, then much of its neutralizing action would be lost, and the acids contained in the vomitus might do more injury than would be possible under ordinary circumstances. Still, my opinion is that the effect is but slight.

Another explanation for the increased frequency of caries during the pregnant condition has been offered by assuming that during this period the tooth-brush is called into play less frequently, and hence the teeth decay from neglect. I only mention this as a fair sample of a number of theories I have met with in reviewing the literature of the subject, and not because I consider it of great value as throwing light upon the etiology of the disease under consideration. Pregnancy occurs at an age when habits in regard to personal cleanliness have become established, and the woman either customarily cleanses her teeth or neglects it altogether, as the case may be. If pregnancy were to have any effect, it would act as an incentive to the use of the tooth-brush, because of the bad taste in the mouth, which is well known to exist at such times. It will be unnecessary to take up the third proposition in regard to the cause of pregnancy, as it has already been discussed when considering the other two.

I have purposely avoided any mention of treatment, as it has not been my intention to take up that portion of the subject, and because it really is unnecessary. If the proposition I have advanced this evening be correct, and if the frequency with which dental caries is met with during pregnancy be due to some condition of the blood, which in turn causes some changes in the composition of the secretions of the mouth, whereby a better habitat is offered for the growth of the destructive micro-organisms, then it necessarily will follow that the treatment for such a condition will naturally fall upon the family physician. It certainly would be interesting to watch the effect of treatment directed along this line, and to ascertain if an anti-lithemic treatment would be productive of favorable results. It seems to me that such medication is indicated as much as that which is more commonly used, as for example the administration of some form of lime-salts. The local treatment of the condition we have been studying, it is unnecessary to say, will fall naturally to the family dentist, and will be treated with his customary skill, and will be productive of the usual happy results.

### SUMMARY.

1. It is probably true that dental caries is more liable to occur during pregnancy.
2. Dental caries is a disease characterized by a molecular disintegration of the normal constituents of the teeth.
3. The disease is caused by the action of certain pathogenic micro-organisms which produce lactic acid, which in turn decalcifies the enamel and exposes the dentine to the attacks of the bacteria.
4. It is improbable that lime-salts are abstracted from the teeth to supply the needs of the growing fetus.
5. More than enough phosphates are ingested to supply the needs of both mother and child, hence the maternal teeth do not suffer from lack of nutrition.
6. During gestation, osteophytes are found, showing an excess of lime-salts in the system.
7. The true explanation must be looked for in some change in the oral secretions, which thereby furnish a more favorable soil for the development of the micro-organisms.

8. There is evidence to prove that the saliva is more acid during pregnancy.

9. This condition is probably due to changes in the blood, whereby its alkalinity is diminished.

10. The analogy between this and the lithemic condition is striking.

11. Vomiting of pregnancy, while it may to some extent aid, cannot be considered a potent factor in the production of caries.

12. Neglect of the teeth during pregnancy cannot be proved to be more prevalent than at other times, and therefore should not be considered among the causes of caries.

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## AMALGAM—ITS USE FROM A PRACTICAL STANDPOINT.

BY DR. W. E. HALSEY, BROOKLYN, N. Y.

(Read before the Second District Dental Society, State of New York, February 11, 1895.)

It is undoubtedly realized by us all that our knowledge regarding our dental alloys is not of the order necessary to our best use of the material, and the place it occupies with the dental profession as a tooth-saver demands a more intimate knowledge of the combined metals and their relative proportions.

How many of us know the metals and their proportions contained in any of the alloys which we buy and use? We accept them largely upon the recommendation of the manufacturer as being the "best" and possessing certain desirable attributes,—viz, "perfect maintenance of color, excellent edge-strength, and absolutely no shrinkage, easily amalgamated with a relatively small amount of mercury, and setting with celerity."

And would the dealer, who is simply endeavoring to sell the product, so proclaim their virtues if we did not look upon them as such? And yet there are those among us who would look upon "perfect maintenance of color" with suspicion, as an alloy probably containing cadmium, or at least so large a percentage of zinc as to detract from the desired edge-strength. And also the "easy amalgamation with a relatively small amount of mercury" would immediately proclaim too large a proportion of tin to allow of good contour-work, and a probable degree of shrinkage which would place it low in the scale as compared with some of the existing alloys.

The superiority of the Lawrence alloy over others in use when it came into existence was immediately recognized, but the reasons were known to but few. The increased proportion of silver added, which was brought to an equality with the tin, and the addition of five per cent. of copper, made of it an excellent tooth-saving amalgam, even in the hands of the most unskillful, and was a long step in the right direction.

It is not my purpose to go into the history and development of our dental alloys, but to suggest substantial reasons why we should know the metals and their relative proportions when combined, so that, if we obtain satisfactory and pleasing results from their use, we may know the reasons therefor; and if the opposite obtains, that we may be in a position to rectify them.

When I first began practice I accepted the teachings of Dr. Flagg, and relied upon "contour alloy, 63 silver, 33 tin, 4 gold" for my principal amalgam work, and I have certainly derived great satisfaction from its use. With a view to producing an alloy with a still better maintenance of color, I have made and used, experimentally, one having the proportions 65 silver, 30 tin, 4 gold, 1 zinc. The addition of even this small percentage of zinc is noticeable in the better retention of color in the mouth, and without any apparent loss of edge-strength ; but there is a little more difficulty in its amalgamation, and I am very much in doubt as to the advisability of using an alloy containing even this small portion of zinc where a tooth is to be saved.

Such a multiplicity of opinion as exists among the dental profession regarding the preparation and use of amalgam must result from unscientific methods, on the part of some at least. In his paper recently read before the New York Odontological Society, Dr. Kirk advanced the theory that our amalgams are "essentially chemical compounds," "the combination of mercury with the metals composing the amalgam alloy taking place in definite atomic ratios." Whether this becomes an established fact or not, it furnishes us with a logical basis for our future work, and is directly in line with the empirical practice of many practitioners who employ a sufficient quantity of mercury to render the amalgam mass plastic enough for easy adaptation to sensitive dentine without pressure It necessitates the presence of mercury in excess to insure the combination of the contained metals in "atomic ratios," after which the excess of mercury must be removed, which is accomplished, in some degree, by wafering the last portion of the filling, crushing it upon the surface, and tapping the filling into homogeneity.

The preparation of an amalgam mass is best attained by combining the alloy and mercury in definite proportions by weight ; the right proportion of mercury with any given alloy is successfully established with a few experimental mixes. If this method be closely adhered to, the results, whether good or bad, will be approximately the same, and there is a vast deal of satisfaction in producing an amalgam, at every mix, of the desired plasticity for comfortable working, without finger squeezing, or further addition of mercury or alloy a second, third, or even fourth time, as will frequently be necessary where guess-work is relied upon. And if we accept Dr. Kirk's method and desire at the outset a mass of "buttery consistency," which is an assurance of the presence of mercury in excess, the balance still has its place in securing the desired proportions.

The practice of using amalgam dry, and without sufficient mercury to produce thorough amalgamation except under the influence of heated instruments, after placing in the cavity is of doubtful utility ; the thorough amalgamation of such a mass, even when attempted with heated instruments, is to be questioned, and the class of cavities which will admit of such practice is small.

The tendency of amalgam to shrink, discolor, and spheroid were undoubtedly the characteristics which led to the above practice, but their elimination, in great degree, is much better secured by improving the standard of our alloys and the careful removal of as much of the excess of mercury as possible after the insertion of the filling.

The tendency to spheroid is a recognized demerit of many amalgam fillings, and is due to the presence of mercury in excess and its influence over the proportionately large percentage of tin contained in the alloy used. The logical method of correcting the defect is to increase the proportion of silver over that of tin in the alloy, and the removal of the surplus mercury. This is accomplished in great degree by wafering, and is still further promoted by the use of sponge gold, as advocated by Dr. Kirk in his paper from which I have quoted.

The odium attached to amalgam is largely due to its abuse and misuse by those in the profession who should know better. As an illustration of what I mean, I will refer to the following case :

About a year ago a patient came to me for the treatment of both superior first molars, which were badly abscessed, fistulous openings being present over each mesio-buccal root. The crowns were mere shells, the mesio-buccal cusps broken away from each tooth, and the cavities filled with the poorest specimens of amalgam fillings that I ever saw in any mouth. The teeth were of fairly good structure, and the bicuspids and incisors contained some of the best gold contour-work I ever saw, and were inserted, as also were the amalgam fillings in the molars mentioned, by one of the best known operators in New York city.

The patient explained that the molars referred to had first been filled with gold when she was a child, the fillings failing and being replaced every two or three years ever since, until there was so little tooth-structure left that refilling with gold was impossible, and amalgam was resorted to, with abject apology, as a last resort. That material was used without any effort to restore lost contour, and no attempt at finishing it ; simply stuffed into the cavities with the suggestion that it might save the teeth a year or two more. After nearly six years, the patient came with an appeal for the cure of the abscesses and relief of the soreness, perfectly satisfied with the fillings, and even regretting the necessity of a drill hole through them to reach the canals, recognizing the service rendered by them. The fillings had creviced badly, and decay had begun at the cervical walls. I advised their entire removal, which was very easily accomplished with a large round bur, showing the exceedingly large proportion of tin contained in the alloy used. The whole bulbous portion of the pulp-chamber was filled with the amalgam, the palatal canal being filled with gold in each case. The buccal canals were open, and contained putrescent matter of the usual character. A few days sufficed for the treatment and filling of the buccal canals, the fistulas healing quickly. The pulp-chamber was filled with pink temporary stopping, the decay removed from the cervical portion of the cavity, which extended far above the gum-margin. Slight undercuts were made and filled with submarine amalgam. The filling was brought just below the gum-margin, and the last portions wafered, which hastened the setting very much, allowing the use of the rubber-dam within fifteen minutes. When exposed by the rubber and thoroughly dried, the enamel edges being nicely trimmed with a plug-finishing bur, the cavity was ready for the final filling, which is to be a combination of zinc phosphate and contour amalgam.

The ability to use these two materials in combination is only acquired after considerable practice and a thorough knowledge of the working qualities of each. The powder and liquid of the zinc phosphate are placed on the slab ready for mixing, an excess of the powder being assured. The alloy and mercury of the quantity desired are weighed out in such proportions as are known to make the desired mix, placed in the mortar and triturated to amalgamation, removed to the hand and kneaded into thorough homogeneity, which is quickly done, as the mass should be of decided plasticity. The amalgam is retained in the hand, the warmth of which will retard setting while the cement is being mixed. The cement should be plastic enough to allow of lining the walls of the cavity with a considerable bulk. A portion of amalgam, of about equal consistency, is quickly placed in contact and interdigitated into the cement in such a way as to cause the cement to dome in the center of the crown, and also to crowd toward the outer edge of the cavity. In this way a very strong foundation is obtained, the weak walls strengthened, and a good color secured. As the cement hardens the enamel edges are cleaned of it, and the building up and contouring with amalgam continued. A number of mixes are necessary, and the last additions are thoroughly wafered, which allows of perfect contour-work, enabling the cutting away of any surplus, and the easy addition where necessary.

In this manner were these two wrecks of teeth made comfortable, strengthened, built down, and contoured to allow of mastication, and really presented an excellent appearance. After the lapse of a year not the slightest indication of bulging or crevicing is present, neither is there any discoloration, except at the cervical margins, where submarine amalgam was used with the knowledge and desire that it would discolor. No portion of the frail enamel-walls was broken, nor was there any recurrence of the abscesses, and every indication points to years of comfortable service.

The practical use of amalgam is so related to that of the other plastics that a paper of this character must necessarily deal with both, and the better way to make this plain is to refer to individual cases. If we resort to plastics for the saving of teeth, as we all do, we must be possessed of an understanding of the desirable attributes of each, and so use them in combination as to make use of their virtues and eliminate their faults.

Gutta-percha is recognized as being a perfect non-conductor, possessed of good color, easily worked, and more nearly approaching perfect compatability between filling and tooth-bone than any other material in the whole list, and therefore ranking first as a preventive of recurring decay, but its total lack of edge-strength limits its use as a filling to those cavities which are not exposed to attrition.

Zinc phosphate is possessed of excellent color, does not shrink, has great adhesive power, and is comfortably worked. It is not to be used in close proximity to a vital pulp, nor is it to be relied upon as a permanent filling, as it is subject to more or less rapid disintegration when exposed to the fluids of the mouth.

Amalgam possesses all the edge-strength needed, resists attrition and the oral fluids, is so readily worked as to permit of any extent of contour-work, even to the entire replacement of a lost crown on bicuspid or molar roots, and has a desirable degree of compatability when in contact with dentine, as is evidenced by its tooth-saving quality. It, however, lacks proper color, is a conductor of electricity and thermal changes, and shrinks, bulges, and spheroids in proportion to the low grade of its alloy and the excess of mercury contained.

As a typical example, a superior second bicuspid is presented, which we desire to save. The patient is young, and tooth-structure soft and frail. The whole approximal walls are lost by decay, also a large portion of the grinding-surface; the fissure also is decayed deeply, uniting the approximal cavities, which are partly filled by hypertrophied growth of gum-tissue. At the first sitting the cavities are syringed with warm water, and carefully packed with cotton saturated with oil of cloves or campho-phenique, to crowd out intruding gum-tissue, secure slight separation, and obtund sensitive dentine. At the next sitting the bicuspids and first molar are placed under the rubber, the edges being carefully tucked under the gum with a thin scaler without the use of ligatures, and the cavities dried. The enamel-edges are carefully trimmed, conserving all that will be consistent with zinc phosphate as a liner and strengthener. The decay is carefully removed from the circumference of the cavities, and, if sensitive, obtunded with oil of cloves, eugenol, or campho-phenique, avoiding any of the escharotic agents. A considerable portion of softened dentine is conserved over the region of possible pulp-exposure, and carefully protected with a thin wafer of low-heat gutta-percha, which is easily placed by picking it up with a warmed instrument touched to the wet stopper of the cajuput bottle, warming slightly over a spirit lamp, placing accurately in the cavity, and pressing the edges into apposition. The oil of cajuput softens the gutta-percha just enough to cause adherence, and also acts as an obtunder.

The first demand for the salvation of such a tooth, when the cavities are prepared, is pulp-protection; and for this gutta-percha is selected without hesitation, three wafers being necessary, one in each approximal cavity and one at the bottom of the fissure.

The second need is to guard against recurrence of decay at the cervical margin, and submarine amalgam is used, being built down to a line with the gum festoon, the last portions wafered and the edges carefully trimmed with a very thin sickle scaler. The hardening by wafering and the careful trimming and finishing of this portion of the filling at this time is a very important point, as it never afterward can be so well and easily done.

The third need is the strengthening of the frail enamel-walls and the prevention of their discoloration. Zinc phosphate ranks first in these desirable attributes, and may be used in combination with the amalgam while both are plastic, or simply as a liner mixed to a plasticity which will allow of easy and thorough adaptation to the cavity-walls with a small ball burnisher, occasionally touching the instrument to an oil-pad to prevent adhesion of the cement.

And now the conditions call for a material possessed of excellent edge-strength, resistive to attrition from mastication, and of good color. Contour amalgam, when properly inserted, fulfills these conditions most admirably. Amalgamated with sufficient mercury to render the mass plastic, the first piece is placed in apposition to the previously-inserted submarine amalgam in the distal cavity at the cervix, and tapped into thorough amalgamation ; each succeeding piece is inserted and tapped (not burnished) into homogeneity until the distal cavity is wholly filled, contoured, and extended into the fissure ; the last portions are wafered, and the lost contour is carefully restored. The mesial cavity is filled in the same manner, uniting the two fillings in the fissure. The wafering must be thorough, rendering full contouring and finishing easy, thereby insuring a minimum of shrinkage and strong edges.

Such a combination filling must appeal to us all as fulfilling its mission of tooth-salvation : the pulp is protected from all outside influences ; the weak walls are strengthened and color is maintained ; the recurrence of decay is guarded against by a coppered amalgam at the cervical wall, and the lost contour restored. The result is a tooth of good appearance, with a prospect of years of comfortable service.

# GOUTY PERICEMENTITIS.

BY EDWIN T. DARBY, M.D., D.D.S., PHILADELPHIA, PA.

(Read before the Academy of Stomatology, February 12, 1895.)

It is often easier to describe a thing than to give it an appropriate name. In the present instance, I am much like the preacher who has prepared his sermon and then fails to find a text to fit it. I am aware that of late the gouty diathesis has been made to stand as godfather and sponsor for nearly all the ills that flesh is heir to. Malaria has been receding into the background, and gout and appendicitis are coming to the front. These diseases may not be more prevalent to-day than they were fifty years ago, but science has made such strides that the ability to diagnose them is made easier and their cure more certain.

I have not come to you to-night with a new disease and an old name, but rather with an old disease and a new name, and my excuse for doing so is that I cannot find in our present terminology one that seems exactly adapted to the condition which I wish to describe. Gingivitis, phagedenic pericementitis, infectious alveolitis, calcic pericementitis, pyorrhea alveolaris, and Riggs's disease are all well enough in their way, and some of them are sufficiently correct to be allowed to remain in use. Each of these, as I understand it, is intended to describe a disease which has its beginning at the gingiva, and not near the apex of the roots of teeth.

It is not my purpose this evening to enter largely into the physiology, pathology, or even etiology of the diseases under consideration. Another has done this much better, I am sure, than I could do it, and I shall take the liberty of quoting somewhat largely from the admirable paper by Professor C. N. Peirce, and appearing in the *International Dental Journal*, April, 1892, and January, 1894. He says, "The pathological state affords the only true basis for a scientific classification of disease. The term pyorrhea alveolaris refers only to one symptom, and is therefore provisional, and more or less objectionable. As you are aware, Dr. G. V. Black has with some degree of appropriateness applied to the disease under consideration the terms gingivitis or phagedenic pericementitis and calcic pericementitis. While these two terms approximate the truth, they do not to my mind express the whole truth." "From a careful study of the abnormal alveolo-cemental membrane, it appears to me that we must recognize two closely allied but yet different pathological states; different, as I shall attempt to demonstrate, in their *etiology*, in their *clinical history*, in their *symptomatology*, and in their *susceptibility to treatment.*

"In the first place, I believe that while pericementitis is associated with calcic deposit, the origin of the calcic salt and the antecedent condition which determines the locality and character of the deposit, as well as the train of totally distinct symptoms which follow, lead inevitably to the conclusion that the different diseases have thus far been confounded. In one form of pericementitis the origin of the calcic salt is the saliva, and in the other from the blood. The former I shall designate as ptyalogenic calcic pericementitis, expressive of the idea that in its origin it is local, peripheral, and salivary. The latter I shall designate as hæmatogenic calcic pericementitis; that it is altogether a distinct affection from the first mentioned, and dependent for its cause upon some morbid material derived from the blood, will, I think, become apparent from the facts which I hope to deduce."

The author from whom I am quoting is to be congratulated upon the nice distinction which he has made and the terms which he has applied to the source from which these deposits arise. Again he says (referring to the hæmatogenic variety of calcic pericementitis) "that in this form of the disease the morbid process begins on the root, and very frequently, if not usually, in the vicinity of the apical extremity, this being in marked contrast to the ptyalogenic form, which always has its origin at the gingival borders." I think it may be said to be generally admitted that two distinct forms of calcic deposits are to be found upon the teeth, the one salivary, the other serumal, or, as Dr. Peirce terms it, hæmatogenic. Again, it is believed by many that the last-mentioned variety is often deposited at or near the apices of the roots of teeth before any lesion or pocket has been formed at the gingivæ. Again, it has been claimed by some that the hæmatogenic variety is an irritant, and is the cause of one form of pyorrhea alveolaris, and not the sequence. In other words, that it antedates the inflammation instead of being the result of the inflammatory condition. The alveolo-cemental membrane is a connective tissue, fibrous in character, exceedingly vascular, and resembling the connective tissue found in articulations and joints in other parts of the body. Its function is not unlike that of other connective tissue, and experience has shown that it is susceptible to the same morbific influences.

Observation has shown that few teeth are lost from any form of pyorrhea alveolaris before the thirtieth year, and that the disease cannot be considered common before the fortieth year. Experience and observation have shown that gout and rheumatoid arthritis are not common before the thirtieth year, but that in one form or another they are quite common after the fortieth year. Analysis has shown that the blood of gouty and rheumatic subjects contains a larger percentage of uric acid than is normal, and that in certain conditions of the system this acid in combination with calcium and sodium is precipitated and retained in the connective tissue of articulating surfaces, producing all the conditions of inflammation, except one,—viz, suppuration. Analysis has shown that the deposit found upon the roots of teeth contains uric acid in combination with calcium and sodium, and that such teeth are frequently found in the mouths of those known to have a gouty tendency or a pronounced gouty diathesis. But you tell me that these coincidences do not establish truths ; that uric acid may exist in larger proportions than is normal in the blood of many persons, and yet there may be no manifestations of gout or rheumatism. Candor compels me to admit the force of the objection ; at the same time I can see no reason to suppose that fibrous tissue, wherever located, may not under similar conditions be equally susceptible to the deposition of uric acid. Dr. Alexander Haig, in his work on "Uric Acid in Causation of Disease," claims that he is able, by certain articles of food, certain beverages and medication, to drive uric acid from the blood to the joints and back again from the joints to the blood ; that it is simply a matter of increased or decreased alkalinity of the blood. Dr. Garrod has shown that the cartilages and fibrous tissues of joints are less vascular and less alkaline than the other tissues or the blood ; and since that is so, the arthritis produced by uric acid is a simple matter of solubility, and can be produced at pleasure to almost any extent.

But it is not my purpose to enter into this phase of the subject. The object of this paper is to describe a few peculiar cases which have come under my observation during the past fifteen or more years,—cases which at the time puzzled me not a little, and even now would bear a little illumination. These cases may not be exceptional, and possibly all of you have seen similar ones. I shall describe them as concisely as possible, and trust that you may grasp the salient points of each.

Mrs. A., perhaps forty years of age, called, suffering much discomfort from a first superior molar. The tooth was sound, with the exception of a minute filling in the masticating surface. All other teeth were present in the mouth, and no indication of disease elsewhere. The first thing to attract my attention was a tumefaction at or near the apex of the buccal roots. It was quite large, and presented much the appearance of an apical abscess just ready for the lancet, except that its color was dark red, almost purple in hue. The tooth was somewhat elongated, and sore to percussion or pressure. Without a moment's hesitation I decided that the tooth was a devitalized one, and with a spear-pointed drill in the engine proceeded to make an opening into the pulp-chamber, the gold filling being my starting-point. As I approached the pulp, my patient gave indication of increasing pain, but supposing that to be caused by my pressure upon an inflamed pericementum, I lessened the pressure and revolved my drill with greater rapidity. You can imagine my surprise and chagrin when I found that I had plunged my instrument into a vital pulp. I said to myself, An anomalous case, indeed—an abscess upon a vital tooth ! I then began to look for a cause, but to my surprise there was no break at the gingivæ, no salivary or serumal deposits to be seen, and no pus in what I had taken to be a sac. Baffled and confounded, I applied the ordinary remedies for pericementitis, devitalized the pulp and extirpated it, filled the canals, pronounced myself a careless dentist, and awaited results. Subsequent attacks of a similar character extending over a period of perhaps five years, rendered the tooth a source of annoyance and discomfort. My patient finally concluded that an empty house was preferable to a bad tenant, and it was removed, the first break in an arch which contained sixteen beautiful teeth. Near the apex of the buccal roots of the tooth in question a deposit of considerable serumal calculus was found, and in my opinion this was the cause of the first attack of pericementitis. I cannot say of my own knowledge that this lady ever had an attack of gout, but I do remember that prior to her death, her hands were much disfigured by nodosities upon the joints of the fingers. If this lady was a victim of uricacidæmia, it may have taken the form of rheumatic arthritis, instead of gout as generally understood. Garrod says, "It is by no means rare to hear of inflammation of a joint, by one practitioner called gout, by another rheumatism, and by a third rheumatic gout."

The following case is more satisfactory, because the patient is living and I have been able to follow it until the present time. Miss B., aged about forty-five, called, with a second inferior molar somewhat elongated and exceedingly sore to the touch. I observed the same tumefied condition upon the gum near the apex of the root, the same angry red appearance of the mucous membrane. The tooth was a sound one, never having been carious. Remembering my former case, I did not attempt to open the tooth, but gave it such treatment as is general in pericementitis. I naturally looked for some exciting cause in the form of calculus, but failed to find any, either upon the tooth in question or other teeth in the mouth. I am positive that there was no pocket at the gingivæ. This attack lasted for several days and gradually subsided, but was followed a year or more later by another, at which time a pocket was apparent, and pus exuding from about the neck of the tooth. The tooth was finally lost, and serumal deposits found near the apex. Two other molars and a bicuspid in this mouth have had like histories during a period of ten years. Another molar is apparently to be lost in the same manner, for during the past few months I have seen the case to give it such treatment as I could to relieve existing pain. I may say just here that but one tooth in the mouth has been affected at the same time, and there is no appearance of pyorrhea alveolaris in any part of the mouth.

I have recently learned the following facts, which it seems to me have an interesting bearing upon this case. The father, whom I knew well, had been a lifetime sufferer from gout, the classical kind, which began with painful manifestations in the great toe, and did not often get above the ankle-joints. I remember that years ago he told me he used Blair's gout pills, made in England, and that he obtained greater relief from these than from anything he had ever tried. He had been a patient of mine for twenty years, and has lost many of his teeth from pyorrhea alveolaris. The daughter whose case I am describing has never been in robust health, and has frequently had painful attacks of gout of the stomach. It seems to me that to an unprejudiced mind the proof of an inherited gouty diathesis is almost positive, and if uric acid has any part in the production of calcic pericementitis, here is a case to warrant the supposition that it was the exciting cause in the attacks narrated.

The case which I am about to describe next would seem to furnish more positive evidences of the dual existence of uricacidæmia manifested in the form of gout and inflammation of the alveolo-cemental membrane than either of those previously mentioned. It is that of a bachelor of about fifty years of age, who called upon me about three years ago with much the same conditions which I have described in the preceding cases. At that time a bicuspid of the superior jaw was the seat of pain. The gum presented the same swollen and angry red appearance. He complained of great sensitiveness to heat and cold, and to pressure. As the tooth was without fillings or cavities of decay, I did not open it, but gave it the ordinary local treatment common in cases of incipient pyorrhea alveolaris. It was some days before relief was obtained. At that time there were no other teeth similarly affected. As I remember the case, there was no discharge of pus following the attack. A year, or possibly eighteen months subsequently, the gentleman called, suffering pain in the same tooth ; this was followed by suppuration, and, of course, a pocket at the gingivæ. Since then two or more teeth have had like histories. Anxious to know whether this individual had the uric-acid vice, I inquired of an intimate friend of his and learned the following particulars. "He has been a 'high liver' for many years, indulged freely in wine, and especially champagnes ; is a great sufferer from gout and dyspepsia."

I have reserved until the last a case which impresses me as being of peculiar significance. A gentleman between sixty and sixty-five years of age has called upon me several times during the past six months, complaining of great discomfort in a superior molar. It has been somewhat elongated and painful in mastication. There have been no marked indications of gingival irritation, no deposits of calculus, but redness and tumefaction along the buccal aspect of the gum. It had failed to respond to ordinary treatment, and as other teeth had been lost from similar attacks, the gentleman insisted upon having this one removed. I found deposits of serumal calculus on both buccal roots. In reply to my inquiry as to the presence of gout or rheumatism in the system, he pointed me to his feet, which were encased in shoes made of soft kid, and greatly out of proportion to the man's stature. He then said, "I have been a great sufferer from gout for many years. I inherited it from my ancestors. I have thrice been to German spas for relief, and spent the whole of last summer at Carlsbad, hoping to find a cure, and am indeed better than in the spring." In reply to my inquiry as to whether he had taken salicylate of soda, he replied that he had taken pounds of it, until it so upset his digestion that he was obliged to discontinue its use. He had also taken lithia in various forms, but with indifferent results. Colchicum afforded the surest relief in exacerbations of the disease, but this was open to the same objection as to the salicylate of soda.

I could mention other cases which have had similar histories, but no additional light need be shed on the subject under consideration. I trust I have not wearied you with these details. Your experience and observation may not have been unlike my own. I have never been satisfied with the theory that all cases of pyorrhea alveolaris were of local origin, and while I cannot furnish proof positive that uric acid plays an important part in the formation of the calcic deposits to be found high up upon the roots of the teeth, I can see no objection to such a theory; and why, I ask, may it not be so? Why may not the connective tissue forming the alveolo-cemental membrane be the seat of uric-acid formations just as often as the joint of the big toe, the ankle, the knee, or the phalanges? The physiology and pathology of such a process is as simple as that of the pin-point nodules which are left upon the mitral valves of the heart in rheumatism, or the concretions of the kidneys. "Inasmuch as all portions of the body have been shown by pathologists to be liable to uric-acid deposits, it is not at all strange that the alveolo-cemental membrane, composed largely of connective tissue, should also become a depot for uric-acid deposits. It is more than probable that as a predisposing cause there might coexist some impairment in the nutrition of this membrane dependent upon either local mechanical force or some obscure faulty innervation. However this may be, the mere presence of these salts leads to the conclusion that here or elsewhere they are derived from the blood by or through the medium of the lymph-stream. With the absorption of the excess of lymph, the residual salts become precipitated upon the cemental surface." (Dr. Peirce, *International Dental Journal*, January, 1894.)

There has been one peculiar manifestation in the cases which have come under my observation which at first I found it difficult to explain, and that is the absence of suppuration in the first or even the second attacks of pericementitis. There have been heat, redness, swelling, pain, but not always pus. But as I have thought more upon the subject, I have concluded that the formation had not yet reached sufficient quantity to produce tissue-disorganization, and that, like other forms of pericementitis, yielded to blood-letting and counter-irritation.

Since beginning the preparation of this paper, my attention has been directed to an essay which was read by Dr. W. J. Reese, of Galveston, Texas, before the Louisiana State Dental Society, March, 1886, entitled "Uræmia and its Effect upon the Teeth." He begins his paper by the statement that as early as 1880 he became convinced that uric acid was the cause of "grave troubles in the mouth," and gives his reasons for believing that it is one cause of what he terms "phagadæna pericementi." Among other things he says, "The term pyorrhea alveolaris is a misnomer. One peculiarity of uric acid is that, while it will produce violent inflammation and intense pain, it rarely causes suppuration, except when in contact with the fluids of the mouth, and not always under these circumstances. Where the saliva does not come in contact, and where it is protected from the air, we have no suppuration on the roots of the teeth." In this particular Dr. Reese's observation has been similar to my own. In the DENTAL COSMOS for July, 1885, p. 394, it is stated that Dr. Reese reported at a meeting of the Southern Dental Association that he had sent samples of deposits found upon the roots of teeth in pyorrhea cases to a chemist for analysis, who found, upon examination, that they consisted almost wholly of uric acid.

In closing this imperfect paper, I would beg you to bear in mind that it is not intended as a scientific contribution to the etiology of a disease, but rather a description of a few cases which, it seems to me, cannot be accounted for except upon the theory of a constitutional vice.

# PULP-PROTECTION.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

In a carious tooth the floor of the cavity sometimes has a place or point where the wall of the pulp-chamber or canal has but a thin septum between it and the cavity-floor, and the problem is one of pulp-protection from thermal shock or irritation. To the various well-known capping or non-conductive methods of procedure I desire to add an alternative one, which consists simply in the interposition of a disk of rubber-dam. The material is always at hand, and with proper punches suitable sizes of disks may be quickly made and kept in readiness. By folding a piece of dam in sextant shape, and with the scissors snipping off the point, an impromptu disk may be made to suit the cases. For example, cut two such disks. Having the cavity formed and dried for filling, the cavity-floor and walls are to be lightly touched with a very little ball of cotton, carrying about a quarter of a drop of pure mastic varnish or other cavity-lining. Then touching the cotton ball with the end of a curved canal broach, pick up the little disk and delicately cover the cavity-floor, to which the disk will stick; mix some cement, suitably soft; put a little on the center of the second disk, lift it with a pair of fine-pointed foil-tweezers and gently place its cement side against the other disk, and with a ball burnisher softly spread the cement under the second disk to completely cover the cavity-floor and partly cover the cavity-walls. Allowing some minutes for the setting of the cement, the remaining area of the cavity can be filled with whatever material may be preferred. The pulp will be doubly protected by the two rubber disks. The larger round disks may, with the scissors, be readily given oval or other shapes to suit special cases.

Of course, similar thin gutta-percha or paraffin-paper disks may be thus used, as may also disks of vulcanizable rubber, and a disk of celluloid or mica is every way preferable to one of metal, even though that be lead.

In filling a cavity wholly with cement, it is a good plan to place some of the mass in the cavity, and follow with a rubber disk, which, when pressed around with a ball burnisher, will carry the sticky cement against the cavity-walls without liability to be drawn back, as may be the case when some of the cement sticks to and is pulled out with the plugger; whereas, in the present instance, the ball moves freely over the surface of the disk, which is soft, and stretches easily under the ball, which comes readily away to permit the completion of the filling as usual. Incidentally, it is worth while to say in this connection that an oiled mica matrix, by virtue of its extreme thinness, smoothness, flexibleness, resistance to acid actions and shapability with scissors, to say nothing of its cheapness, leaves little to be desired in the way of a readily applied and removed cavity-wall. It may be ligated or otherwise secured around the tooth; as, for example, by heat-softened gutta-percha pressed against it on either side between the teeth. With due care in adjusting the matrix, no subsequent finish will be required.

The elasticity of the mica matrix suggests discretion to avoid its accidentally springing into the mouth, and its friability renders caution requisite to prevent the leaving of broken pieces between the teeth. Of course when the rubber-dam is in position, neither of these considerations will be in point.

# FUNCTION OF THE PALATAL RUGAE.

BY HENRY BURCHARD, D.D.S., M.D., PHILADELPHIA, PA.

In an essay read before the Academy of Natural Sciences of Philadelphia, and published in the Dental Cosmos, January, 1889, the curved ridges known by the above name have been described by Dr. Harrison Allen, with the care and minuteness which characterize all of that gentleman's work.

He details at length variations as to shape, position, and bilateral asymmetry.

For the purpose of this paper they may be described as a series of ridges running in a transverse direction, and having usually a curved outline. Those of the smallest radius are most anterior, those of increasing radius posterior, and those most posterior are commonly almost at right angles with the median line. They extend to about, say, one-half the length of the hard palate.

In addition to these transverse markings there is an ovoid elevation overlying the incisive foramen, which Dr. Allen names the incisive pad.

Frequently there is a longitudinal elevation in the median line, overlying the line of junction of the palatal processes of the right and left superior maxillæ.

Immediately behind the ridges which embrace the cervices of the incisor teeth are usually the most marked rugæ, the highest and shortest; and they grow shorter in height, increase in length, and their curves lessen, until the most posterior are nearly straight. This description is merely approximate, but in a general sense is true. Any one may determine this by an examination of a number of models.

The earliest stage of deglutition mentioned by text-books on physiology, even in the late editions of Landois and of Foster, is that of the passage of the bolus to the space between the muscles of the soft palate and the dorsum of the tongue; its passage thence to the constrictors of the pharynx is described as the first stage of deglutition.

Properly, however, deglutition begins as soon as mastication, and its coincident insalivation, is completed, and the bolus gathered into the longitudinal furrow of the tongue. The tip of this organ becomes fixed by engaging with its dorsum, the anterior rugæ, and the action of its intrinsic muscles gives a somewhat wavy movement to the dorsum which engages progressively succeeding rugæ. The anterior part of the raphe of the tongue is in contact with the incisive pad. The bolus is, through the movement of the tongue, literally squeezed to a passage where it is surrounded by muscles, and then passes to the pharynx.

The curving direction of the most anterior of the rugæ and the presence of the incisive pad insure a better, a firmer contact of the tongue's tip than if these ridges had a straight transverse direction.

The posterior rugæ being usually nearer straight, serve to make a better contact than if curved, for here the surface of the tongue is engaged in straight lines. That these prominences do not extend farther back on the palatal processes is because they would be useless there, for the muscles of the soft palate and those of the tongue serve to propel the bolus toward the pharynx.

It is obvious that in addition to the above office, the rugæ assist the tongue in its government of the position of the food during mastication.

That they subserve a purpose in the speech function is undoubtedly true, aiding in the formation of certain letter signs ; but that this is a function secondary becomes evident when the presence of rugæ in lower animals is noted, and even Professor Garner's researches as to Simian language cannot raise this office beyond the position of a secondary function.

To sum up, the general function of the palatal rugæ is that of insuring a good and progressive contact of the dorsum of the tongue with the anterior part of the hard palate. Were the palatal surface smooth there would be less fixation, a tendency to a slipping of the bolus, some interference with mastication, and a check in details of articulation.

The writer has been unable to find any mention of this function of the rugæ in text-books or journals at his disposal ; so that should any one show priority as to the trifling matter of originality involved, it will be cheerfully relinquished.

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# PROCEEDINGS OF SOCIETIES

## NEW JERSEY STATE DENTAL SOCIETY.

(Concluded from page 246.)

*Discussion on Dr. Palmer's paper, continued.**

Dr. FLAGG. On this subject of dental education it is hardly necessary for me to say that I have carried it in my heart for thirty long years. I do not look at this subject in the same light as my eloquent and respected friend, Professor Truman, looks at it. From the very incipiency of the boards of examiners in the different states, I said to my faculty associates, there is an idea out of which, if any good can come to dentists, it must come through that sieve. I espoused the cause of such boards from the very beginning ; I have stood by the side of the boards, and for extra examinations, from the very first, because I recognized that we needed some lash, that we needed some spur.

I recognized that it was necessary to have some spur in order that our students should take in a small part of that which was given them by the faculty ; I recognized perfectly that they could pass a decent and creditable examination even if they took in a small part of it, and I recognized that those young men who went out from our school knew more by far than any one member of the examining boards.

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* "Dental Legislation : a Plea for an Interstate Regulation" See DENTAL COSMOS for March, page 237.

But we know that they will have to go before the board of examiners, and must pass them on anatomy and physiology ; and, although they may be able to take up work and go into practice, the law is such that they have got to pass on those other branches ; therefore we had better not let them slide through. So in that way, I contend, the boards of examiners have worked upon us ; I contend that they have stood behind me, as a power behind the throne.

And what have the colleges done that requires all this consultation? They have asked me again and again to go to the National Association of College Faculties, and I have told my faculty, open and aboveboard, that I will not go to any meeting of the National Association of College Faculties so long as—what? So long as the list of reputable colleges, so called, is made up by the National Association of College Faculties upon such a ground as this : We will not receive students after the 20th day of October, and we will not receive students for a shorter period of time than three years ; if you do those things you are not reputable. Now, you could not pass an examination for a fireman in any city of the United States on any such terms ; you could not pass an examination for a policeman on any such terms ; no base-ball club would take in a man on any such terms. It is a question of ability. You simply have to demonstrate, in one way or another, that you know something and can do something. Now I contend that half a dozen men getting together and forming a dental school, and a lot of such schools forming an association, and making rules to compel every student, no matter what his abilities or qualifications may be, to spend three full years before such faculties, is absurd. If a man is fitted to pass the regular examination, it should be sufficient.

I am a friend of the boards, and you will always find me right straight there. I never go back after I have made up my mind solidly upon anything and believe I am right. So far as I can speak as a member of the faculty of the Philadelphia College, I have nothing to say of the various state boards, except God bless you.

Dr. JAMES TRUMAN. Mr. President and gentlemen, I don't think the gentleman who has just spoken knows anything about the Association of Dental Faculties, as he acknowledges he has never been there, and says he would not go there. The Association of Dental Faculties does not admit colleges in that way ; it is extremely careful in regard to that matter, so careful that some of the colleges have been knocking at the door for the last four years and cannot get in. Their examinations are very careful, and the whole matter is considered by a special committee before they can get into the association ; and when they once get into that association, if they are not very careful in their management of matters and things, they are turned out, as one college found out to its own cost, a cost of five thousand dollars or more the first year, before they got through with it.

Dr. G. CARLETON BROWN. In regard to what Professor Flagg has said of the methods of the National Board of Faculties, I know nothing. What he has said in regard to the boards of examiners I heartily agree with. With reference to written examinations, the New Jersey Examining Board requires written examinations entirely, and every paper is on file and can be produced at any time. The members of the board do not know the localities the candidates come from. There is a list, and every candidate has a number. He may come from next door, and the examiner would not know it if he did not happen to see him ; and it would make no difference if he did.

With regard to Professor Truman's remarks, I take exception to everything he said. He misinterprets the examining boards. The New Jersey law was not passed with any intent to drive at the colleges that were educating their students. We do not claim that we forced reputable colleges into anything. We say the colleges have done a grand work,—the ones that are at the top. It was alleged that we sought to push out the other colleges, giving a pull to these and a push to them. We did push them ; and it is true, as has been stated, that the standard of education as given by the colleges is taken from the lowest, and not the highest.

Why any college should be antagonistic to the examining boards I do not see.

The New Jersey board is not political, and the members of the board are not appointed by the governor direct ; they are appointed by the governor on the recommendation of the state society. We do not claim to be perfect. We are doing the best we can in dealing with these subjects.

Dr. Mintz. Mr. President, I cannot help thinking that the boards of the different states have it in their power to get their laws into such shape that they can be very nearly a unit. All it requires is that a slight amendment to the law be introduced and properly brought before the legislature, and have it passed, giving each board the right to do what they think proper with reference to their treatment of men from different states.

The examining boards have done a great deal of good. They have taught the students to understand that they must be able to pass not only a good college examination, but also an examination by the state board. A young man has no business to attempt to practice dentistry until he has prepared himself properly to do it ; and a man who goes through a college and takes a three-years' course of instruction, and after that passes a certain examination and gets a certificate from an examining board, is likely to be well prepared.

What we really need is that the different state boards see to it that hereafter the laws of the different states be so amended as to make them thoroughly harmonize with one another ; and then, with the united efforts of the college professors and the examining boards, we can expect a very high class of practitioners.

Dr. Maxfield. The Massachusetts law was put on our statute-books through the combined efforts of individual workers in the profession. The great defect in that law is that all the appointments that have been made under it have been made through political preference. Two years ago, the appointments which were made by the governor woke up the individual members of the profession in the state to the danger of political influence ; so that the Massachusetts State Society have now taken the matter up, and have passed a resolution that every year a committee of five be selected to choose candidates to be presented to the governor for appointment. The law must be changed ; an amendment must be made so that the appointments cannot be made as they are made at present. We cannot expect, certainly, that the action of one board will be received by another, when one board is composed of men of professional reputation and the other simply gets there through political pull. We should set aside political preferences, and go for the best men. In the state of Connecticut they succeeded in inducing the governor to appoint all Republicans on the board. It is a matter where politics should never enter, and yet in most of the states politics control the whole thing.

Dr. DONNALLY. When, some years ago, you were sending people from New York, New Jersey, and Massachusetts to the District of Columbia, I was asked the question, "Have you a good law? You ought certainly to have as good a law in the District of Columbia as they have in any of the states; many of the people are there for such a short while, and if they set out for a dentist, not being acquainted, they might get a person who is not qualified, and who has not the legal right to practice." I am sorry to say that it is not so, but we hope it will be in time. It has been said here to-night that these laws would never be stricken from the statute-books. That may be true, but we may improve them, and proceed to place them upon a proper level.

I want to call your attention to a brief of a decision of the Supreme Court in the matter of our law, which says,—

"That this bill is constitutional cannot be gainsaid, in view of the opinion delivered by Justice Field in a decision affirming a decision of the Court of Appeals of West Virginia, which had given judgment against a man who had violated a similar act of that state. Justice Field says, 'The right to continue the practice of professions is often of great value, and cannot be arbitrarily taken away, any more than real or personal property can; but there is no arbitrary deprivation of such rights where its exercise is not permitted because of a failure to comply with conditions imposed by the state for the protection of society. The power of the state to provide for the general welfare of the people authorizes it to prescribe all such regulations as may be necessary to secure the people against the consequences of ignorance and incapacity, as well as of deception and fraud.'"

I suppose the question is beyond dispute that the law is constitutional. I do not mean that every dental law is constitutional in every feature, but that the state has the right to control these matters and fix standards for the colleges and for the examining boards. I want to congratulate the profession that there is not much difference between the boards and the faculties as might appear from some things said here to-night. I do not believe there is any very great difference; I believe we are all working for the same end, the good of the profession, only having little frictions now and then, which it is impossible to avoid. I believe that we are on the road to very great improvement in this line, and I hope that nothing may be done to antagonize the great interests of the profession in this matter, but that the colleges and the profession will work together for the better protection of the people by such legal enactments as will compel men to go through a college, or to acquire the necessary education in some way. And I think while a three-years' course is required of some of the colleges, it is manifestly unfair to those colleges that have labored for years to raise the standard to that point, to recognize colleges that have a two-years' course.

Dr. PALMER. I must differ with Dr. Donnally somewhat. I think that Dr. Sweeney's paper covered the general legal aspect pretty thoroughly; at any rate it is a paper that is well worth reading by anybody who is interested in this question; you can certainly learn a good deal from it, whether you agree with it or not. In the same number of the COSMOS there is an editorial article on the Pennsylvania law that will repay careful reading.

I agree with what Dr. Holly Smith says in regard to the state rights' question having been settled, and I think that in our efforts to institute laws and regulations in this direction state lines should be lost sight of. I never for one moment had the idea of presenting a law to Congress for enactment; that was not in my mind, and I am sorry that my paper should have conveyed that impression. I think it would be folly to attempt anything of that kind, but I do believe that the various state boards can agree upon some method of overcoming the difficulty, so that there shall be some common standard, recognized as a standard, for the United States, by which standard a man who has been examined in any state and pronounced qualified to practice, shall be permitted to practice in any other state if he pleases.

I do not believe in Dr. Luckey's idea of a National Board of Examiners, for the reason that it would be entirely too much labor, and require altogether too much time, for such a board to examine all the graduates throughout the United States; but such a national board of representatives might get together and fix upon this standard that I speak of. They could arrange, in due time, some standard that the colleges and the boards of examiners would carry out; and a certificate granted to one coming up to this standard should be good anywhere in the United States.

The subject was passed.

Adjourned to Friday morning, July 20, 1894, at 10 o'clock.

### FRIDAY MORNING, July 20, 1894.

The president, Dr. R. M. Beesley, in the chair.

The following paper by Dr. J. E. CRAVENS, of Indianapolis, Ind., was read by Dr. Palmer, in the absence of Dr. Cravens:

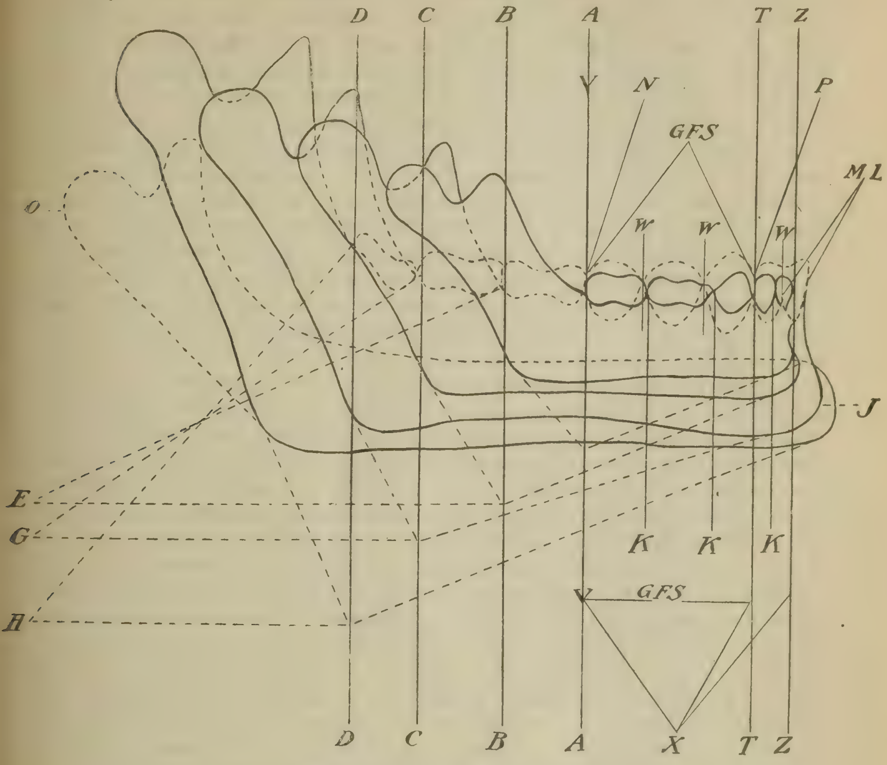
## THE FIRST PERMANENT MOLARS—THEIR RELATION TO THE FOUR JAWS OF MAN.

The first permanent molar is the patriarch of the mouth. It is the progenitor, usually, of the second and third permanent molars, according to embryologists. It is the supporter of the crowns of the deciduous molars when their roots are being resorbed, thus affording or preserving adequate masticatory surfaces for the needs of the growing subject. It also extends backward the grinding action, in proportion to the development of the jaw.

It is rather difficult to recall all the points of value of this much-abused tooth, but I have arranged a diagram to accompany this little paper, which is intended to show the relations of the first permanent molar to what I have chosen to designate as the four jaws of man,—

viz, infancy, youth, middle life, and old age; not counting the time of life when there are no teeth; be it either the puling babe or toothless decrepitude of extreme age.

According to my measurements and observations, the interdental space between the first permanent molar and the second deciduous molar is permanent, what I have called a *fixed space;* anterior to this the second bicuspid erupts, occupying about one-sixth less of the space (diameter antero-posterior) than the preceding deciduous



KEY TO CHART OF THE FOUR JAWS OF MAN.

A, First jaw. (At first permanent molar and second deciduous.)
B, Second " ( " " " " " " permanent.)
C, Third " ( " second and third molars.)
D, Fourth " ( " rear of third molar.)
ML, Middle line (both sets of incisors). Also first fixed space.
Z, First fixed space, line of.
T, Second fixed space, line of.
V (A), third fixed space, line of.
GFS, grand fixed space. The deciduous and successors, same space.
KKK, Interdeciduous spaces; not fixed.
E, First molaric modification of jaw.
G, Second " " " " (Rearward development.)
H, Third " " " "
P, Base of development of arch.
N, Base of rearward development, adult jaw.
X, Converging lines from three fixed points governing development.
O, Pantalon, or senile jaw (second childhood, edentulous).
J, Chin of adult jaw.
The permanent teeth are outlined in dotted lines.
WWW, Changing spaces, reduced from deciduous, interdental.

molar. This permits the first bicuspid, already erupted, to settle back so that its anterior or mesial face is about one-fourth receded from the position of the mesial face of the first deciduous molar which preceded it. This gain, or loss, of space by the bicuspids is necessary to the welfare of the arch. The central incisors, erupting at about seven years, often are crowded and compelled to assume irregular positions, temporarily, as nature evidently intends; their demands for space must be answered laterally or by enlargement of the arch. The permanent cuspid properly erupts in such manner that its mesial face occupies the same space as that of its immediate predecessor. The additional space to accommodate its increase of twenty-five to fifty per cent. in diameter is gained at the rear by the recession of the first bicuspid, which has, unobserved, settled back slightly during the incumbency of the deciduous cuspid. This space often is observed, but little understood. By the final enlargement of the arch on either side the median line, the incisors have, meanwhile, righted themselves. This constitutes the irregularity of the first class, that is self-regulating, because of progressive dynamics of jaw development.

If now the bulwark and base of the forces operative in what has been mentioned has been the steadfast first permanent molar, what may be anticipated from its premature removal or its removal at all? If the anterior permanent teeth have all been fully erupted, probably they will remain in position. If they have not all erupted, the temporary derangement may become permanent and other permanent deformities result, such as tilting or rotating of bicuspids.

The development of the jaw will probably be arrested or interrupted, but the effect upon the second molar will be particularly disastrous in most cases. It appears impossible to determine an age when the extraction of the first permanent molar may safely be practiced.

It is my opinion that nature offers a solution for this problem in her own unostentatious method. Let the roots of the first permanent molar be filled to prevent inflammation, etc.; let the crown be honeycombed by a drill or weakened by other means; natural processes will do the rest. The tooth will gradually waste away, letting the second molar settle forward imperceptibly, maintaining its perpendicularity.

In closing, I would say, Don't extract this tooth; study the diagram of the four jaws; let the first permanent molar waste away, if go it must, and receive the later benedictions of your young clients.

## *Discussion.*

Dr. Luckey. Mr. President and gentlemen, the advice of this paper is, Don't extract the first permanent molar. My experience leads me to say, Don't be afraid to extract those teeth. I feel that I stand upon firm ground when I say that, while the first permanent molar is one of the important teeth of the mouth, it is also one of the most dangerous teeth in the mouth. It is important from its position and its size; it is dangerous because of its inherent weakness in nearly all mouths. There is no tooth in the human denture so subject to decay as the first permanent molar. Why it should be so weak and subject to decay is a matter of theory, but that it is so every practical dentist knows. The danger of extracting this tooth, as claimed, lies in the arrest of the development of the jaw, and allowing the second molar to move forward and break up or disarrange the articulation. While in many cases that is true, it is a fallacy if adopted as a principle in general practice. The gain to the patient in making more room for the other teeth is greater than any benefit that arises from the preservation of those teeth in position. Given a denture of a moderately high grade of development, with hard, well-organized teeth, and I think it is a wise plan, where the prospects are that the denture will not be crowded, to take every precaution to preserve and fill the first permanent molars; but when the teeth are of soft structure, and it is seen that the arch will be crowded, I think it is wise to extract not only one, but all four of the first permanent molars. Take the lower jaw; how often do we see cases where the first permanent molar on one side has been extracted, and before the patient is twenty-one years old the whole jaw is pushed around to one side, and the alignment of the teeth has been changed entirely. If the corresponding tooth on the opposite side had been extracted at about the same time, the teeth would probably have maintained their position. It is true that sometimes the articulation is awkward, more awkward than would have been the case had the first permanent molars remained in place; but we know they will not remain there unless you crown the roots with a metallic crown, and that is an operation that few patients, comparatively, are subjected to, because the expense and annoyance of the operation are too great, therefore if any means of preservation are undertaken it will usually be the filling of the tooth. You may succeed in keeping them in the jaw from the eighth or tenth year until the fifteenth or twentieth, but in doing so you have kept the bicuspids and cuspids crowded, so that by that time those teeth will require filling on nearly all their approximal surfaces, which would probably have been avoided had the first permanent molars been extracted. I have in mind the case of a girl who was brought to me at the age of ten; the first permanent molars were then badly decayed in the lower jaw, and I advised the extraction of all of them. I took out the molar on the right side. The little girl objected then to having the other one out, and would not be persuaded; so in the course of a few weeks we filled the other one. I saw the patient after she reached the age of sixteen, and she had on the side where the tooth was not extracted six fillings in the teeth of the lower jaw, and on the right side of the same jaw there was absolutely no decay, and had never been any fillings. That was as clear and practical a demonstration to my mind of the value of extracting the first permanent molar as I have ever seen. The probability is that, had the left molar been extracted at the same time, the same condition of affairs would have ensued on that side of the mouth.

The theory advanced in the paper in regard to filling the roots of the first permanent molar after the devitalization of the pulp and then honeycombing the crown of the tooth with the drill, was almost amusing. If the crown was useless, why honeycomb and leave it? Why not cut it off and grind it down, instead of leaving it to the natural process of decay? If it were only to prevent the tipping of the second molar that the roots were left in the mouth, that might be a reason; but to my mind it would rather cause tipping of the second molar. We have seen the second molar striking at the neck close over to the second bicuspid, with the root of the first molar in there, forming one of the most difficult operations to get that root out without injury to the second bicuspid or the second molar. The impingement of the neck of the second molar upon the root of the first molar acts as a point of resistance, and unless the articulation of the upper jaw was perfect, it would, I think, allow the tipping of the second molar more quickly than if there were no roots left in there. I think that when you extract the first molar, if it is done early enough,—say before the eighth, ninth, or tenth year,—there is much less danger of the tipping of the second molar than there is when the first molar is retained until the eleventh or twelfth year.

It is an old, old story and an old, old subject, and I don't know that we will gain anything by prolonging its discussion from my standpoint, except, perhaps, to impress upon those who may be tempted to retain the first molars not to be afraid to extract them.

Mrs. Dr. WHITE. I believe that I agree with the author of the paper in not wanting to have the first permanent molars extracted. I think they are very valuable teeth. I think the greatest trouble we have with the first permanent molar is when it is being erupted, and that if the gums are sufficiently lanced at that time there would be less decay. Their weakness may be in their calcification occurring at a certain time. I think it is very likely that the gum holds the tooth, and that it is the eruption of the tooth that especially weakens it. If the patients could be taught by the physician that there is need of lancing and relieving the tooth from that hardened gum, there would be more first permanent molars saved. Their position in the mouth would seem to make it very necessary that they should remain; there is no other tooth that can take their place. I was wondering just now why it was that, in the case described by Dr. Luckey, filling was so necessary on one side of the mouth and not necessary on the other. It seems to me that fillings may become necessary sooner in the teeth that the patient does not use. It may be possible that the first permanent molar had not been properly filled, was sensitive, and the patient avoided using that side.

If we could get the care of the patients early enough, before this tooth is erupted, we could manage it very well; but dentists are not allowed access to the patient at that early age, and the physician will not often know or admit that the first permanent molar is the cause of any trouble. If we find persons with the first permanent molars retained, it seems pretty good evidence that the person is of a strong temperament and has good teeth to begin with. That is what we seldom do find, as we know. My practice has not been as extensive as many of yours, perhaps, but the first permanent molar has been a problem with me.

Mrs. Dr. SLADE. I believe in taking care of the deciduous teeth, so that the first permanent molar will not be injured by their decay. I have a great many children coming to me, because I give a good deal of attention to that class of patients. When I was seventeen years old I began practice in my father's office, and he used to put those cases in my hands, and since then I have been studying them more or less ; and I find that where children have been allowed to have the toothache, and have abscesses on the deciduous teeth, it has injured the first permanent molars to a certain extent ; that there is more or less decay before the child is ten years old, and when I find that to be the case I prefer to extract them, especially if there has been an abscess ; otherwise I am very careful not to extract.

Dr. CHEW. In some cases I find it best to take out the first permanent molars in order to save the others. Where the teeth are small and the mouth large, I would save the first permanent molars.

Dr. HAYHURST. This is a subject in which there can be no fixed rule laid down. The circumstances under which we meet them are so different, even in the hands of one practitioner, that he himself, or she, will never be able to formulate a rule that will be applicable to all cases. Most of these cases of trouble with the first permanent molars that are presented to us show that they have been neglected so long that there is almost nothing left of them, and it is impossible to preserve them. Therefore I say that, under the circumstances, there can be no set rule laid down, and every person who practices must exercise his own judgment and act according to the best light he has.

It has been a great problem with me when to extract these teeth and when to leave them. I take into consideration the condition of health in which the patient comes, as well as their condition of life. On general principles, I aim to preserve all the teeth that can be preserved, and not to extract if it is possible to avoid it with safety. I try to save all. The preservation of the shape and contour of the face is dependent upon the mouth and teeth, therefore we should keep the teeth in place as long as we can, in order that we may have the perfect features that God intended man should have.

Dr. SANGER. Mr. President, I am sorry that Dr. Cravens is not here. The absence of the essayist detracts very materially from the essay, because every essay, like every operation, is accompanied by the individuality of the writer or the operator, and whatever he intended to teach us is partly lost sight of. He is not here to defend himself, and I am not here to defend him, but I do notice one thing in his paper which I would not like to see passed unnoticed by this society. He speaks of leaving the molars in the mouth to waste away. Teeth do not waste away in the mouth. They decay, and decay is contagious. Rocks waste away by the action of water, but teeth decay, and the decay in a tooth is a menace to other teeth. If there is in the mouth a tooth that is not worth filling, it should be extracted ; it don't make any difference whether it is the first molar, the second or the third molar, or an incisor. That is a principle in practice ; and I believe that when Dr. Cravens speaks of drilling holes in a tooth, honeycombing it, and allowing it to waste away, he is teaching a dangerous principle. Whether the first permanent molar should or should not be extracted depends entirely upon circumstances. You may just as well try to lay down a rule of practice in the treatment of devitalized teeth as to make a rule on this question. We have seen by the discussion here that it is impossible to lay down any one rule. It is a well-known fact in medicine that there are, practically, no specifics. It is also true that there is no one absolute rule covering all cases in relation to any one tooth in the mouth; but I believe it is an axiom that no tooth that is not worth filling is worth retaining in the mouth.

Dr. PALMER. I am glad that Dr. Sanger said what he did, because that was my particular exception to the paper. I think Dr. Cravens is entirely wrong in that respect. The idea of preserving the first permanent molar has always been my idea; I am like Dr. Chew, very conservative in regard to that. I never have been able to see the matter in any such light as Dr. Luckey does. I think I may narrate one case; that of a girl I know very well, twelve years old, who lives in my town, and occasionally comes to see me. She has very fair teeth, and is rather thin-visaged. The first permanent molars were in good condition, except some very small cavities in the crown. When I saw her Dr. Luckey had extracted one, and had advised the extraction of the other at a later period. Her mother brought her to me to have the other molar extracted, and I refused to do it. I said I knew Dr. Luckey very well, and knew his ideas in regard to the matter, but I did not agree with Dr. Luckey, and if she wanted the tooth taken out she had better see Dr. Luckey and let him assume the responsibility; that I would not assume it. He has since taken it out. The result will be some contraction of the arch. That contraction may be imperceptible, and may not amount to anything so far as we can see, but I do believe that contraction will occur to some extent. In some cases it is considerable, in others less. We have no right as dentists to work and act only for the present; we must consider the future, we must consider what the effect will be at a later day. I do not think that I am wrong in saying that that contraction, if the girl grows to womanhood and has children, will show to some extent in the next generation. It may not; but if for two or three generations the practice of extracting the first permanent molar is continued, when those molars are in fair condition, I believe it will result in an increase, rather than a decrease, of irregularity. That is the main reason why I am opposed to it.

One other point. A good many dentists who advise the extraction of the first permanent molars only go half-way, and extract two. I would either leave all in the mouth or extract all four. Sometimes they extract two on one side, and sometimes the two upper ones. I think the result of this is always a change in the median line, so that in later life the centrals will move out of position.

On motion, the paper was passed.

The remainder of the session was devoted to the transaction of routine business.

At the closing session, held Friday afternoon, July 20, 1894, the officers to serve for the ensuing year were elected, as follows:

Dr. C. F. W. Holbrook, president; Dr. R. M. Sanger, vice-president; Dr. Chas. A. Meeker, secretary; Dr. George C. Brown, treasurer; Drs. Harvey Iredell, Oscar Adelberg, Wm. S. Fish, and S. C. G. Watkins, executive committee.

After the officers had been duly installed, the meeting adjourned.

# UNION CONVENTION IN BUFFALO.

(Concluded from page 256.)

## SECOND DAY—*Morning Session* (Continued).

THE following three papers, constituting a symposium on operative dentistry, were read. The first was by Dr. F. E. HOWARD, of Buffalo, and was entitled,—

### THE PREPARATION OF CAVITIES FOR GOLD FILLING.

In the consideration of the preparation of cavities, I can introduce but a few special cases, as the field is so wide that more could not be undertaken at a meeting like this. Let us suppose, in all cases, that the rubber-dam is in position, and the surrounding surfaces dry.

We will first select a superior bicuspid, with a defective sulcus, that requires to be traced out and filled with gold. We will suppose that the decay has not extended very deeply, or to have involved any complications. The first step would be to introduce a small bur (my choice would be an inverted cone), and to force this well down to the bottom of the cavity, carry it forward or backward upon the floor, and bring it to the surface repeatedly in the endeavor to open a channel below the enamel-margin. Blow the *dêbris* from the cavity with an air-syringe, from time to time, so that the outlines may be distinctly seen. Now change the small bur for a cross-cut fissure-bur of proper diameter, introduce this at the central portion, and with one or two sweeps the rough edges are removed and the general shape of the cavity is established.

We desire, in this instance, to have a generally flat or concave floor, with walls perpendicular to it. The extremity of the sulcus need not necessarily be of the same depth. One or two shallow grooves will insure anchorage, and with the marginal edges beveled the preparation is complete. In manipulating the fissure-bur for countersinking, hold it at an angle of about forty-five degrees from the position at first given. Then, by sweeping it around the edges at the same inclination, the margins are properly countersunk; or this may be accomplished with finishing trimmers, files, etc. The cavity is now practically ready for the introduction of the filling.

If I were to prepare an ordinary coronal cavity in an inferior first molar, I should open up the cavity in the same general manner as that just described, except that I would use the burs in the right-angle attachment of the engine. In these teeth we usually have a central cavity, and radiating in four directions from that are fissures. By introducing the bur in the central cavity, it may be carried back at the depth of decay under the enamel and brought to the surface, repeating this until the channel is opened up as far as the extremity of the fissure. Returning to the central portion, the second fissure is opened up in the same manner, and this is continued until all are completed. The chip-blower must be in constant requisition to keep it clean. With a chisel and the cross-cut bur the angular portions are removed, the edges are countersunk, and the proper outlines given to the cavity. Again we have the flat or concave floor, the side walls perpendicular to it, and at one or two points slight undercuts to retain the filling. The extremity of the fissures need not be as deep as the central cavity, unless the decay is deep.

Should it occur that in the cavities described we have extensive decay, the procedure will be a little different. The first opening-up of the cavity may, perhaps, be accomplished more successfully with chisels, by breaking down the weak surfaces of the enamel until the orifice is nearly as large as the interior. After giving desirable outlines to the cavity, the burs can then be successfully used. The same care of side walls, floors of the cavity, etc., should be observed that has already been recommended. We may find at one or two points deep undercuts, with strong overhanging enamel. It is not always necessary to cut this down, for the portion of the cavity beneath may be so lined with zinc phosphate as to give it complete support, and this will enable it to withstand all masticating force, and at the same time give better outlines to the cavity and filling.

In preparing labial cavities, a symmetrical outline may be obtained with a bur-wheel extended to the healthy enamel-margin. The floor should be fairly flat, with vertical side walls. The marginal edges should be beveled or countersunk, and retaining grooves cut at two or three points, or, if very extensive, the groove may extend nearly or quite around the cavity. If the filling is made to extend a little above the gingival margin, it is less likely that secondary decay will occur. In other words, a weak enamel gingival border is not advisable, and should be cut away to the cementum line. The same rule should be observed in preparing all buccal surface-cavities.

In preparing approximal cavities of medium size in the superior central incisors, it is taken for granted that sufficient separation has been previously secured. With thin enamel-chisels, remove the angular part of the tooth bordering on the palatal surface, to facilitate proper approach to the cavity, so that it may be excavated and filled from that direction principally, as such operations not only preserve the appearance of the tooth more perfectly, but are more serviceable. When the general plane of this surface is given with the chisels, the next step should be to remove a portion of the decay with a spoon-shaped excavator, and two or three sweeps of the instrument will accomplish this. Next, with an emery or corundum strip, lubricated by drawing it across a paraffin block, dress down the margins until they are smooth and even. By further removal of decay, we are enabled to determine what will be the outlines of the cavity. If large, and the walls thin, it will be necessary to rely for the retention of the filling upon the cervical portion of the cavity exclusively.

With a pointed chisel, we may secure anchorage at the labio-cervical angle in the following manner: When we have decided upon the depth to go in this direction, a groove should extend from the extremity of this angle in the direction of the incisive edge, cut in the dentine, if possible. This should extend down as near the incisive edge as possible without weakening the centro-labial portion of the tooth. It is sometimes desirable to obtain further anchorage in the opposite direction. This may be secured with the chisel just described, aided by a bur and a hatchet excavator the blade of which is turned at an angle of forty-five degrees from the handle. We may cut from the central portion of the cervical wall in the direction of the palatal angle to the desired depth, a groove from the extremity of this angle upon the palatal wall in the direction of the incisive edge. We now have a V-shaped anchorage in this locality, which, together with the one in the opposite direction, gives us retention for our filling that is entirely reliable, without an undercut at the incisive edge. The latter would only weaken the operation, without adding to the security of the filling.

Should these cavities be comparatively small, and the teeth thick, it might be desirable to have a slight undercut in the direction of the incisive edge. A sand tape, lubricated and drawn over this surface, will bevel the marginal edges sufficiently. When, from any peculiarity of shape, this cannot be accomplished, it may be done with enamel-finishing instruments.

Approximal cavities in superior bicuspids may have to be made compound. The weak, imperfect wall of enamel overhanging the approximal portion may be cut down with chisels. After a moderate-sized opening is effected in this direction, a cross-cut enamel bur will enable us to open up the cavity yet further. At this stage, we will remove the decay from the cavity by the aid of spoon-shaped excavators and the chip-blower, noting the extent of the decay and the character of the rough marginal edges remaining about the outline of the cavity. The buccal, palatal, and cervical walls are cut down with a chisel, and where it can be accomplished it is desirable to carry the cervical portion of the cavity above the gingival margin of the gum, as a safeguard against secondary decay. The side walls and the cervical portion should be left vertical to the floor or plane of the cavity. The sulcus must be traced out and included in the cavity. The bucco-palato approximal angles, in the direction of the coronal aspect, must be widened out so as to leave a dovetail, triangular space, which largely serves as the anchorage for the filling. This latter operation is best accomplished by the aid of cross-cut burs, together with enamel finishing-burs. To secure anchorage, cut in at the bucco-palato-cervical angles, after giving this portion of the cavity proper depth, which will be determined by the character of the gold which we propose to use, and the manner of its preparation ; a groove in the dentine, if possible, should be cut in the direction of the coronal portion of the cavity. The cervical margin should be made nearly flat, transverse to the floor or general plane of the filling, with perhaps a slight dipping in at the bottom ; when the marginal edges are nicely countersunk, the cavity is ready to fill.

Approximal cavities in superior molars do not differ very widely from those in the bicuspids. The general preparation, opening up of the cavity, shaping of the lateral and cervical walls, are almost identical. I need only call your attention to one point of difference. In the superior molars we have two depressions in the coronal surface. It will often occur if the approximal cavities are at all large, that they will encroach upon these depressions so far that one may be necessarily included in the operation, and where we desire to make quite an extensive contour filling, we may leave the bucco-palato coronal angles of the side walls stronger by depending largely for our anchorage in the coronal portion of the tooth, avoiding the necessity for dovetailing at these angles, which are sometimes weak when the decay is extensive. If, now, the proper outline is given to the buccal, palatal, and cervical walls, we may obtain anchorage in the same general manner as in the bicuspids. With the marginal edges nicely countersunk by the aid of chisels, enamel-finishing instruments, etc., the cavity is completed for filling.

Dr. E. D. Downs, of Owego, followed with a paper, of which we give an abstract, entitled,—

## Choice of Filling-Materials, and Methods of Use.

In this symposium, choice of filling-materials succeeds the preparation of cavities ; but, probably, in the majority of cases, the material has been decided upon before the preparation, for the opening, shaping, and retaining features must be largely guided by the material to be used. The first material suggested is gold ; that is the one that possesses the most desirable qualities for a durable filling. Other materials have valuable features that gold does not possess, but they are also found lacking in important qualities.

Accepting gold, then, as the most desirable for so-called permanent fillings (I think durable would be a better word, both in our literature and in contact with our patients), any deviation from its use must be guided by the conditions or circumstances which present themselves in a particular case.

The first reason for deviation that I would suggest, is the skill of the operator. It is the duty of every dentist to know and appreciate his own limitations, and he should let no desire for fee tempt him to overstep that line. If you find you cannot make good, durable gold fillings in distal cavities of molars, don't try, but use a material that you find is durable, for the first duty to your patient is conservation of the organs presented for your care.

The personal equation being eliminated, the skill of the operator unquestioned, I would next suggest the general health as an important factor. To be so wedded to gold as to impose long, painful, nerve-racking operations upon those of delicate physical organizations, or, worse yet, suffering from nervous difficulties, seems little short of criminal, and liable to cause serious injury

Liability to recurrence, as indicated by the quality of the teeth or conditions which present themselves in the mouth, is another reason for deviation that may be generally recognized. Men whose judgment we must respect tell us other materials are more durable, and particularly have they commended the effect of amalgam upon the dentine of teeth below medium in quality. Where deviation seems best, I would suggest gutta-percha and tin in positions not exposed to attrition ; amalgam usually elsewhere. When the point of recurrence is at the cervix, I think combination fillings of gold and amalgam have been suggested, but for some reason not explainable I have no love for this combination, and only use it to overcome insurmountable or annoying difficulties in obtaining access for the proper condensing and finishing, or where cavities extend far below the gum. When recurrence is always at the cervix, we should examine carefully to see if the fault is not in the operator, due to a lack of care on the part of the patient. In deciding upon deviation we should be guided largely by the probable period of exemption from recurrence, which knowledge comes from the ability to diagnose, and the personal acquaintance time gives us regarding the probabilities in each patient's mouth ; yet the knowledge gained by long acquaintance is often the hardest to acquire in this class of cases, for the very failures which it is impossible to prevent cause them to seek other counsels in the hope of relief.

Many of you will think me debased in tone for suggesting expense as a factor in the choice of material ; but it is really only the few who come to the front rank in our larger towns and cities who can eliminate this consideration. To those of us practicing in smaller places, when a portion of our clientele are in very moderate circumstances, this becomes a very important consideration. Ethical evolution makes rapid progress, and considering the age of our profession dentistry has held its own in this direction ; but the dentist is not so far ahead of his environment as to be running his office as an eleemosynary institution, and even if he were, he would find practical difficulties in his way, so long as he and his family maintained the habit of eating. So I say to you, if your patient cannot afford to pay for gold in his back teeth, put, in carefully prepared cavities, carefully inserted and finished amalgam fillings, and thank God you are a good dentist, and a benefactor to suffering humanity, and a greater honor to your profession than he who would have turned him from his door to fall a victim to the hypodermic needle.

Neglect of personal care of the mouth, by the patient, may influence choice of material. Insufficient access suggests cause for deviation. Of course, in most cases this may be overcome, but in many the mutilation necessary seems to more than offset the advantages to be gained.

Hypersensitiveness may necessitate temporary work. Oxychlorid or oxyphosphate-of-zinc fillings for a few weeks or months will usually allow the dentine to return to its normal condition. Liability to thermal changes may frequently be overcome by simply lining with a non-conductor ; but when the cavities are deep-seated, with a tendency to irritation, I prefer to varnish with a chloroform solution of fir balsam, or an ethereal solution of gum copal, and fill with oxyphosphate of zinc, and later, remove a portion to veneer with a metallic filling.

The age of the patient seems to me to offer important reasons for deviation. I would say that, as a rule, very little gold should be used before sixteen. Previous to that, there is not enough resistance in the teeth to make it probable that fillings are to be enduring. Gold, requiring more extensive free cutting than other materials, entails larger future sacrifice of the teeth when renewals are necessary. Moreover, in approximal cavities, I believe that gutta-percha often lasts the longer, and requires much less sacrifice of tooth-substance. Liability to thermal changes is also thus avoided, with all the misfortunes that it entails.

Children under this age, during the time most likely to require our attention, are frequently passing through the most nervous period of their lives, and long sittings and painful operations are to be avoided, so far as is consistent with the well-being of their teeth. The materials suggested for these cases are, on approximal surfaces, particularly of the incisors, gutta-percha ; fissures in molars and bicuspids, tin, or tin and gold, or where the teeth are of very good quality, gold alone. Where these cavities are large, especially in the molars, oxyphosphate of zinc, and occasionally amalgam.

My own practice, my reading, and my personal observation have been sufficient to make me take a firm stand and refuse, even at the expense of loss of patient, to place gold in young teeth, except, as indicated, with occasional exceptions that present themselves, and do not seem amenable to ordinary rules.

I had supposed this was accepted dental doctrine and very orthodox, until recently, when some observation and conversations with men of good practice have led to the discovery that it is far from universal; and while I have not gone much into details, because so much has already been written, yet it is my desire to present it in such a manner as to call out the opinions of others, even if it leads to my discomfiture.

If there is any one place in which correct doctrine should be more firmly established than another, it is in our treatment of the little ones; for no greater responsibility ever faces a dentist than when a little child seats itself in his chair. On his treatment there may rest the future health, appearance, and well-being of a man or woman. Consideration of pocket-book and ideas of parents have no place here; you stand responsible for that child, and nothing or no one must be allowed to interfere.

So far my paper has been on choice of filling-materials, which, for convenience, I have chosen to treat as deviations from gold. You will all recognize that I have far from covered the ground, for I have said nothing of pulp-exposures, building up with amalgam badly broken teeth that are even unfit for crowns, and many other things: but my paper is already too long, and I am further asked to suggest the methods of use of the different materials.

In my own office, semi-cohesive cylinders receive the preference. In the smaller class of approximal cavities I usually condense by hand-pressure; in all others I use an electric mallet. This instrument has been condemned by many, but to those who have become familiar with it it is a great comfort. With an intelligent assistant to anneal the gold and carry it with pliers to the cavity, personal exertion is reduced to the minimum, and I often feel that I am resting when condensing the gold.

The old Bunsen battery was certainly a great care, but, speaking within my own experience, the Partz acid gravity battery I find always ready for use, requiring less care than my dental engine. But do not understand me as advocating any particular method of condensing gold; I believe just as good results are attained by one method as by another. The rest is a question of personal adaptability and comfort. I usually prefer filling perhaps one-third of the cavity by hand-pressure, the exact portion depending upon the character of the work. When the use of the mallet begins, I prefer rather smooth, rounded-edged instruments, beating the gold together and expelling the air with a sweeping movement of the hand, keeping the filling as near level as possible, going over all surfaces occasionally with a hand instrument. Large contour fillings are sometimes finished with No. 30 or 60 rolled gold.

It is not my usual custom to drill pits for starting. When the shape of the cavity is such that the first cylinders have a tendency to rock, I place crystal mat gold at the bottom and carefully knead it to place. This form has much less tendency to rock than cylinders, and some as satisfactory fillings as I have ever made have been done entirely with it. When there is so great a tendency to rock that even this form of gold gives trouble, and extreme sensitiveness or any other reason makes me disinclined to cut away to overcome it, a matrix is firmly adjusted with two or three large, loosely rolled, soft-gold cylinders at the bottom. A large pellet of cotton is then placed over them, and they are forced and condensed to place. The cotton is then removed, and the gold examined with a hand instrument to see that all is firmly in position. Other gold is then built upon what will usually be found to be a firm base, although the remainder of the filling should be retained independently of any adhesion to it. The same tendency may be also overcome by placing a little oxyphosphate or hardened fir balsam dissolved in chloroform at the bottom, and, catching a few pieces of gold in it, it is allowed to set or dry. Then these pieces are condensed and more added, and the filling is continued. But it is to be distinctly understood that in no degree are either the oxyphosphate or varnish to be depended upon to retain the filling.

Of course, you all recognize these as devices that have been published many times, and they are ingenious methods for overcoming annoying conditions. But they are to be treated as such, and not as resorts for escaping the proper shaping of cavities. Exceptional methods are justified only by exceptional conditions.

Shall I tell you of the use of an ice-water bottle in mixing oxyphosphate, or of the many other things about it that are spread over the pages of our dental journals? I can only recapitulate things, and sound warnings often given before. It is a treacherous material: on coronal surfaces often doing wonderful service; on approximal surfaces as treacherous as quicksand, and yet possessing features that make it indispensable. It has been recommended to fill at the cervix of approximal cavities with gutta-percha before introducing it. Coating with paraffin is said to add to its durability. I varnish all cavities in which I place it, for fear of injury to the pulp.

Gutta-percha is a filling-material that needs careful manipulation, which it does not always get, yet its durability is marvelous. Cut into small pieces; place over a water heater before it is hot, that the pieces may be slowly and evenly heated throughout; varnish the cavity with a chloroform solution of fir balsam, as recommended many years ago by Dr. A. M. Holmes, and pack with the hand instruments used for gold. Avoid surplus.

Tin, once the "stand-by," fallen somewhat into disuse, now again revived, is one of our best materials for children's teeth and teeth of soft structure. So much has been said of it lately that it hardly seems more than necessary to call your attention to it. Professor Darby, of Philadelphia, has demonstrated its cohesive properties in shavings. Excellent foil may now be obtained, and its use should become more general. It is said to preserve tooth-structure when packed in wet cavities. Like gutta-percha, it lacks in its resistance to mastication.

Amalgam, which has been "through the war," left apparently bleeding and dying on the field, still bobs up serenely to comfort the poverty-stricken, and be our sheet anchor when everything else fails. It will save old roots hardly worth a crown, and teeth with but outer walls standing may be built up so as to save the necessity of one for years. I prefer to use a fairly dry mixture, but not so dry as advocated by many. In approximal cavities opening into the coronal surfaces, or where walls are badly broken, I like a matrix. Placing the amalgam pellets in the cavity, condensing with instruments, and frequently throughout the filling with cotton or bibulous paper, occasionally removing a layer of the amalgam before adding other pieces, you will have a filling that will set quickly, and, if finished in accordance with this method, will usually have and retain a bright, light, inconspicuous appearance. I sometimes work gold into the final surface, but do not see that I gain much over the use of the cotton or paper. This method of bringing the mercury to the surface, and the removal of the upper portion, gives a hard, quick-setting filling.

It seems unnecessary to mention other materials, but I cannot close without one more reference to the matrix. For plastics, it seems to me indispensable, and occasionally in building up badly-broken teeth, I leave a band matrix on over night. I make quite free use of amalgam in building up teeth with but little of their walls remaining; for while I am a friend to the golden crown, I am only so as a last resort. Some years ago, I made considerable use of the matrix in gold work, and get occasional valuable service from it yet. I do not care to discuss its merits in this connection; I only know that in my hands it is not often useful. Friends tell me I miss a great comfort, but I feel I do better work when I have my edges, inside and outside, in full view. If the fault is in me, I am sorry, but I must keep within my own limitations.

I have not recognized the need for taking up in detail the filling of a lot of cavities with different materials, and possibly thereby I have missed the spirit of the task assigned me. When a cavity is properly shaped and the material selected, the rest is comparatively easy. In gold work, particularly, I think most of our failures are the result of improper preparation, or finishing, rather than improper packing of gold. I have tried to indicate some of the principles that guide me in the choice of materials in my daily work. In methods, I have tried to indicate just enough of the general principles by which I am guided to give you an opportunity to discuss modes, if you choose.

Dr. F. B. Darby, of Elmira, then read the following paper:

## Finishing Fillings.

The very idea of undertaking to tell a gathering of dentists how to perform this work, when they have been doing it very acceptably to themselves for years, seems almost ridiculous. I have no new or original method to offer; in fact, can hardly present an original idea, for the subject was threadbare years ago.

There is no doubt in my mind but that every dentist within my hearing knows how properly to finish all fillings, but the question is, Does he do it? The lamentable exhibition of unfinished amalgam fillings which are daily paraded before us testifies that he does not. Unfinished work probably had its influence.

Every dentist knows that there has not yet been produced an amalgam which will upon hardening leave a smooth surface. He also knows that the rough surface is detrimental to the stability of his operation, leaving the question of appearance aside. Now it must be granted that the large majority of amalgam fillings are not introduced with the idea that they are to receive a fine finish ; consequently when hard they are not susceptible to the refining influence of the engine and polishing materials. But when properly introduced, under cover of the rubber-dam, and ordinarily quick setting, they may be finished before its removal, and with the expenditure of but very little time.

First, they should be trimmed into shape with properly formed, sharp instruments ; then followed, if approximal, with the finest cuttle-fish strips, and finally polished with flour pumice, using architects' cloth as a vehicle. Fillings that are accessible to the engine should receive the same treatment, substituting the fine leather polishers for the tapes. Fillings that are given time to harden, and require a second sitting, will necessarily demand more time, and the emery tapes and fine corundum will be needed at first.

Tin fillings require a good deal of burnishing throughout the process of finishing ; but otherwise they require the same treatment. It will be found, however, that sand-paper disks or strips cut better than emery on tin.

It is of course understood that all oxyphosphate and oxychlorid fillings are hardened under the rubber-dam, and finished before its removal. Sharp scrapers, when the filling is accessible, should be used to remove the surplus, these to be followed with the fine cuttle-fish strips, and the final finish given with architects' cloth, without the help of any powder whatever. The coarser tapes or disks may be used for removing surplus, in lieu of scrapers, if preferred, but more time will be required to do the work. Fine corundum stones or scrapers may be used on accessible surfaces. The burnisher, if used at all, should be without force.

A gutta-percha filling without a smooth surface is an abomination ; but to produce it is not always an easy task. The friction with chloroform, as advocated by some, has serious objections, for while it leaves an even surface, it does not leave a hard, smooth one. The use of hot instruments for trimming is liable to leave an imperfect filling. Grinding is out of the question, so that nothing remains but the cutting instrument, finely sharpened, to accomplish the work. A little experience will enable the operator to produce almost a perfectly smooth surface, if he keeps his instruments sharp.

The labor of finishing approximal fillings is reduced to a minimum by using a properly adjusted matrix for gutta-percha and oxyphosphates. A mere wiping of oil will prevent the latter from adhering.

Gold fillings seem to be the pets of most operators, and therefore receive the most attention, when really it is no more essential that they should be smooth than any other. They call for the same *modus operandi* that is suggested for hard amalgam, with the addition of burnishing. Sharp trimmers should be employed for approximal fillings, followed with emery strips or disks, and this with cuttle-fish, and the architects' cloth with flour pumice for the final polish. Between each step the burnisher should be used. The engine is suggested when accessible, with fine corundum, followed with the leather buffs and pumice to a final finish.

I suppose the last touch given a gold filling is simply a question of taste. In front teeth I have seen large gold fillings which were as dazzling as high-finished Bowery jewelry, and quite as suggestive of deficiency in refined taste. The modest, soft, velvet-like finish which flour pumice will impart to metals, has no equal, both for durability and appearance. This should be applied after the filling is finished, when one is satisfied that it is good enough. It requires but a minute more of time, and the result justifies the outlay. Apply it with buff leather polishers, running the engine very, very slowly, or if with architects' cloth or linen tapes, work them slowly. This flour pumice is easily obtained by stirring ordinarily fine pumice into water, and allowing the bulk to settle, after which pour off the cloudy water into a shallow dish, and place it in the sun to evaporate, and when dry it will leave the flour pumice ready for use.

Emery strips and disks are much more effective for cutting gold or amalgam if a little olive oil is applied. They also run smoother, with less annoyance to the nervous system, and also prevent to a considerable extent the heat from friction.

You will all agree with me in the assertion that overlapping edges are the rocks upon which many of our finest efforts are wrecked, so that I need not caution you against them. Perseverance and a good supply of sharp trimmers will enable us to avoid the danger. I have no sympathy for the man who fills approximal cavities in posterior teeth without the matrix, and has a protrusion of filling to cut away at the gingival margin.

Too many fillings are introduced without the final result of finishing in view, consequently much grinding and vexation of spirit is required to remove a surplus which would not have been there if the original shape of the tooth had been given a moment's consideration at the outset.

A few moments' careful study of the articulation will very materially lessen the work of finishing, and relieve the necessity of coarse corundums, which have no place on properly shaped fillings.

### *Discussion.*

Dr. H. J. BURKHART, Batavia, found the subjects presented in the three papers too varied for discussion ; would have found it easier if there had been a description of a certain cavity to begin with, then the method of preparing that cavity, the choice of filling-material, method of inserting the material, and the finishing of the filling. There would have been definite subjects of discussion, but the whole subject of filling teeth covered too much ground. All are agreed that in the majority of cases gold, if it were not for the expense, is the most satisfactory material, and he considered crystal mat gold one of the most useful forms in which the metal had been prepared, though sometimes it will become discolored.

Dr. W. A. WHITE, Phelps, said that the discussion of the choice of filling-materials was always with us, and we never will get past it. So many conditions combine to influence the choice that there could never be a rule. He, however, had brought with him a tooth, which he recently extracted because it was suspected of being the cause of neuralgia, which had an amalgam filling inserted more than fifty years ago, which had preserved the tooth and was in good shape, though bad color, to this day. This is only one of hundreds of proofs that amalgam cannot be surpassed as a filling-material under proper conditions.

Dr. A. P. BURKHART, Danville, had found it a mistake often made to select an amalgam of a low price. The best in his experience was the Philadelphia Standard Alloy, which costs $6.00 an ounce and is well worth the money. There is no certain test for amalgam, except years of wear in the mouth, and where one that is entirely satisfactory has been found the question of price should not be sufficient to make a man risk a change for the worse. In approximal cavities in bicuspids and molars he favors tin and gold.

Dr. W. W. COON, Alfred Center, said that he had found the Philadelphia Standard one of the best of the amalgams, and one of the few alloys which would adhere to copper amalgam. This combination makes a very satisfactory filling. Tin will last better in children's teeth and give better service than gold.

Dr. F. A. GREENE, Geneva, thought it was a mistake to say too much about the cost of the gold in a filling. We all know that a filling for which we charge five dollars will not contain more gold than will sell for fifty cents. It is not the value of the gold so much as the time it takes to properly pack and finish the filling. When we fill with amalgam we should take time to thoroughly prepare and dry the cavity, take pains to get the excess of mercury out of the amalgam, give the time necessary to insert and finish the filling as it should be, and then charge for the skill and time expended and the results we get. Disabuse your patients of the false idea that you charge for the material used.

Dr. W. W. BELCHER spoke of copper amalgam. He had found that it would save certain teeth better than any other filling; teeth which decayed away from gold fillings were saved by the substitution of copper amalgam.

Dr. A. C. MCALPINE, Warren, Pa., spoke of the great importance of kindness and gentleness in dental operations as mitigating the pain, and, by lessening the dread of the dental chair, leading to more frequent consultations and the applying for needed treatment more promptly. He quoted from Ruskin to the effect that faults, with the exception of idleness and cruelty, are apt to be jostled off during life, but unless we are deliberately kind in each and every act we will acquire a cruel nature. This thought should especially govern the dentist in his practice with children. They are to be our patrons in the future. "Deliberately kind" should be the watchword with them.

He also thought amalgam as a filling-material deserved care in manipulation, and would repay for the care and thoroughness with which it was handled.

Dr. R. KESSEL, Buffalo, spoke of partially filling large cavities with cement and finishing with amalgam, thus avoiding trouble which came from the shrinkage of the amalgam. He fills from the edge of the cavity first, so the amalgam would not crowd the cement over the edge.

Subject passed, and on suggestion of the Business Committee incidents of office practice were called for.

Dr. F. H. LEE spoke of the use of mineral paint fused upon the enamel of artificial teeth to modify coloring and shade to match peculiar cases. He uses the Downie furnace to fire the teeth, and is able to get very pleasing results by the expenditure of little trouble and very little time ; it only takes about five minutes in the furnace. He exhibited specimens of teeth which he had colored, and said the furnace was also useful to replace pins which had been broken out of porcelain teeth.

Dr. CAPON said the coloring applied to teeth as described by Dr. Lee would last many years ; he had used the process, but preferred the Land furnace and used German colors. He thought those applied with the Downie furnace inferior, and unlike the coloring of natural teeth.

Dr. LEE asked if it was not generally true that after vulcanization the colors appeared lighter than before.

Dr. McALPINE said that if you get just sufficient heat to incorporate the colors, they will not change. He had been using the process for over three years, and thinks if the results easily attained were better known, it would receive more attention.

Dr. GREENE told how a gold filling could be simulated on a porcelain tooth by the same method.

On motion, adjourned till 2 P.M.

### *Afternoon Session.*

The convention was called to order at 2.30 P.M., and Dr. W. W. COON, of Alfred Centre, read a paper, of which the following is an abstract, entitled—

### HYPODERMIC MEDICATION OTHER THAN FOR EXTRACTION.

The essayist called attention to the wide range of usefulness of hypodermic medication in the general practice of medicine, and the advantages of this method of medication in dental practice. Drugs suitably prepared in the form of tablets are now furnished for hypodermic use by dissolving in sterilized water. The tablets could be used as well by the mouth, always bearing in mind that the activity of nearly all drugs, more especially of narcotics and those which possess direct action on the great nerve-centers, is from three to five times as great when administered hypodermically, and about twice the time elapses before the effect is expressed by the mouth.

The drugs which would be found useful in dental practice for hypodermic medication are caffein, strychnin, nitroglycerin, ergot, morphin, and apomorphin. The essayist condemned the use of hyoscyamin because of its unpleasant effects, though its use would be indicated in neurotic patients with superabundant secretion of saliva but for the uncomfortable dryness of the throat caused by it.

Apomorphin hypodermically is an efficient and prompt emetic.

Atropin to be used chiefly in combination with morphin when indicated in alveolar abscess, as a local anesthetic and sedative.

The vascularity of the oral cavity quickens the absorption and enhances the effect of the drugs. Most gratifying results are obtained by the use of small doses of the drugs. Where, from idiosyncrasy, nausea or giddiness supervenes, caffein is especially useful in combating it. Caffein is useful also in cases of depression following the administration of nitrous oxid, as it counteracts the effects of narcotics and acts as a cerebral stimulant. It is a local anesthetic closely related to cocain, both in chemical composition and physiological effects.

The essayist directed attention to the property shown in some cases of exciting erotic tendencies, and advised always having a witness present when obliged to administer cocain to female patients.

Strychnin is a stimulant to the vaso-motor centers. It raises the arterial pressure with slowing of the pulse. It is one of the best cardiac stimulants, and is indicated in cases of weak heart and surgical shock. Tannin is the chemical antidote for strychnin.

Ergot is of use in hemorrhage following extraction, especially in cases of hemorrhagic diathesis. Digitalis may be given in combination with ergot with advantage in cases of hemorrhage.

Nitroglycerin is of use in all cases of heart-failure, its effects closely resembling those of amyl nitrite, but being more persistent. It is also useful in hysteria, angina pectoris, and hemicrania. It is the physiological antidote for cocain.

The perfect cleanliness of a hypodermic syringe is imperative. With this condition obtained and the use of freshly boiled water for making solutions for immediate use, there is no valid objection to the use of medicines in this way. Ordinary care and the skill that comes from practice enables one to insert the needle with little or no pain. The only cases of slough or abscess which the essayist had ever seen from the use of the syringe had been where some irritating substance was injected into dense gum-tissue.

The easiest and best place in the oral cavity to inject is under the mucous membrane, just above where it is reflected from the superior maxillary gum-border to the inner side of the cheek. Here the needle goes easily and absorption is very rapid. There may be occasional indications for the exhibition of some of these drugs when operating for hypersensitive people of low vitality, that the system may be rendered less sensible to nerve-shocks.

### *Discussion.*

Dr. C. T. Howard, of Rochester, said the paper contained much that was useful to the dentist, and would repay careful attention. The action of many drugs, when administered hypodermically, was much more prompt and satisfactory in cases of emergency than the action of the same drugs when administered by the mouth ; but the use of the hypodermic syringe has certain disadvantages, among which are the dread it inspires in many patients, and the liability of the syringe being found out of order when needed. Unless frequently used and carefully cared for, it will be troublesome. If it is to be depended upon to save life or relieve alarming conditions, it must be carefully cared for and kept in perfect condition.

Dr. F. W. Low, of Buffalo, asked Dr. Coon what his experience had been with local anesthetics containing cocain and nitroglycerin. As nitroglycerin is in some measure an antidote to cocain, does it not to some extent hinder its effect? Because of unpleasant symptoms in a case in which he had injected four or five drops of "Dorsenia," which was advertised as containing only about three per cent. of cocain, he had been using tropacocain, thinking it less likely to affect the heart than cocain.

Dr. COON, in reply to Dr. Low's question, said that nitroglycerin combated the physiological effect of cocain without diminishing its anesthetic quality. His reason for writing the paper was the importance of a dentist being posted as to remedies, and ready to administer them instantly in case of need. In cases of syncope from nitrous oxid or chloroform, much may depend upon being accustomed and ready to apply remedies without loss of time.

Dr. LOW asked which, nitroglycerin or strychnin, was the better in cases of collapse and surgical shock.

Dr. COON said nitroglycerin was better, because it acted more quickly.

Dr. W. W. FREEMAN, of Warren, Pa., asked Dr. Coon what remedy he would use for excessive formation of pus in a case where there had been an abscess.

Dr. COON said he would use atropin, as it hindered pus-formation. Subject passed.

Dr. H. H. BOSWELL read the following paper:

## ABUSE OF GOLD CROWNS.

Believing the time has arrived when a protest should be made against an abuse so demoralizing in its influence as to seriously threaten the dignity and integrity of our profession, I have hurriedly prepared this paper to express my indignation at the insult offered to dental art in the "abuse of gold crowns."

I refer to incisors, cuspids, and bicuspids, all of which I have seen capped, and it is this common habit of sticking gold crowns anywhere for a few dollars that I am pleased to call an outrage on dentistry.

Because it is our privilege to do with roots and broken-down teeth as we please, is no reason why we should impose upon nature by filling the mouth with shiny, brassy imitations. This practice is so common that I have come to know people by their teeth. The crowns are so conspicuous and detractive that I am unable to disassociate them. If there were cases demanding these crowns, it would be bad enough, but from my experience there are none; and to account for their frequent use I am charitable enough to think that it is the work of the tradesman rather than that of our professional brethren. But if there are any on the honor roll who are using them, I hope they are now present. A little "gold treatment" may not hurt them.

Is it not as ridiculous to replace a beautiful white tooth with one of gold as it would be to paint a landscape with golden trees and golden grass? It would be as reasonable, and the same excuse answers for both,—*It is easier than to imitate nature.* The only difference is, no one would be foolish enough to pay ten dollars for the picture. Then I am afraid patients are under the impression that they are getting the best when gold teeth are used.

Besides the objections named, there are other reasons why gold crown-work is not the best method to be employed in saving roots and teeth, and should be avoided when possible. If the tooth to be capped has a living pulp, it is quite impossible, because of sensitiveness, to reduce the tooth to the size of the root, where we are supposed to get an adaptation, consequently the band will set out under the gum, presenting an irritating edge or shoulder, producing a result with which you are all familiar.

Another reason is because of the large quantity of cement necessary to fill the cap. That portion under the cap near the cervical margin secretes fluids, which, on being retained, decompose, infecting the cement, and eliminating a decidedly unhealthy odor. Especially true is this when the gum is inflamed ; the odor arising from decomposed serum is foul beyond my power of expression. And the more cement you use, the greater will be the nuisance.

My advice to all who do crown-work is to remove the remaining tooth, whether dead or alive, so that the root can be shaped and ferruled without overlapping margins, giving an opportunity to get a close metallic adaptation all over the root, thereby removing the necessity of using much cement. I find the porcelain-faced tooth the most satisfactory.

Now that you have my ideas on the unsightly aspect of gold crowns, and that I may not be understood as condemning the practice generally, let me say a word upon their commendable features. In appearance they are never good looking, but in their *usefulness* nothing could be more perfect. They not only build up and make useful teeth that hitherto were lost, but also assist in replacing others, by affording attachment for bridge-work. What, then, could be better than these crowns in their places ? Which, of course, are out of sight.

The conclusions to be drawn are that gold crowns judiciously used are a blessing to mankind, but in the hands of the unscrupulous or unskilled are oftentimes a curse, and when they appear in the front of a mouth at this age are evidences of the work of one or the other.

### *Discussion.*

Dr. W. W. FREEMAN, Warren, Pa. That the abuses spoken of by the essayist do exist to an alarming extent, not only among that class of men in our profession who we are pleased to term charlatans, but also by the more reputable practitioner, from whom we have a right to expect better things, and who in the exercise of his function as a dentist should exhibit the highest degree of judgment, skill, and taste, is a fact that cannot be denied.

I agree with the gentleman to whom we have just listened, that the use of so abnormal an amount of gold as is necessary in the construction of an entire crown intended to substitute any of the anterior teeth, is an abomination, consider it from any point of view that we may.

Viewed along the line of pure esthetic taste, the excessive use of gold in conspicuous positions in the mouth, whether in the form of gold crowns, or the building up of large contour fillings, is a practice to be decried by all who are at all interested in the development of the highest degree of art in our professional work. The practice of such an abuse not only casts an indignity upon our profession, but outrages every law of harmony and taste in the "human form divine," and is at the same time an imposition upon the patient that should not for a moment be tolerated.

Certainly it displays an exceedingly vulgar taste, in either patient or dentist, when the least delight in such method of restoration is expressed.

Were there any circumstances that would warrant this method of procedure, we might, but with regret, permit its adoption. But there can be, in the present advanced condition of crown-work, no good reason why the teeth spoken of should be restored in the manner described.

That the restoration of badly broken-down and decayed molars by the use of the gold crown is a rational and legitimate method of procedure, no one can deny. For all other teeth we have numerous crowns, some of which are entirely of porcelain, others of gold with porcelain facings ; and surely the degree of skill requisite to make and put in position one of these crowns, and to do it nicely, is not so great but that it may be accomplished by any one of average ability.

The existence of this practice I think largely due to the increased manufacture of all-gold crowns, and their use by those who are not skilled in making their own crowns. I cannot agree with the essayist in the point he mentions as to the impossibility of capping or crowning a tooth having a living pulp. It is true that the reduction of the tooth to a uniform size from its neck to its coronal extremity, for the reception of the crown, will occasion some discomfort to the patient, —not more, perhaps, than the destruction of the pulp by existing methods.

This grinding may not be excessive if the process known as jacketing be employed, in which case the fitting of the jacket is first done to a nicety, and the porcelain subsequently built upon it to the desired form, and baked in the furnace.

If the patient cannot endure the pain consequent upon, or will not permit the grinding of the tooth to the desired form for the placing of the crown, then any further attempt to operate in this direction must be abandoned, as the train of evils following an imperfect fitting of the crown, either as regards its close adjustment to the neck of the tooth or its ease of adaptation to the gum line, will be identical with those described in the paper just read. In the first case the cement would be exposed to the deleterious action of the fluids of the mouth, and the consequent undermining and destruction of the structure. In the second case a decided periosteal inflammation would soon be established, that would not only be extremely disagreeable to the patient, but would, if long continued, produce such a degree of irritation that the necessity of its removal for a more perfect adjustment would be indicated.

There is one abuse in connection with the application of the gold and porcelain crowns that the essayist has not touched upon. That is in the matter of adjusting the occlusion of the crown with the antagonizing natural teeth. I have known the artificial crown to be beautifully finished and placed in position, the occlusion was found to be imperfect, and instead of reducing the crown with wheel or file, the antagonizing natural tooth was ground away, producing a hypersensitiveness extremely disagreeable and possibly aiding in the ultimate destruction of the surface so ground. I would suggest that the natural teeth be not touched in this way, under any circumstances whatever. I take it that the instruction of the essayist to us is that we try in all that we do to imitate nature as closely as possible. If we are conscientiously painstaking in all our operations, we will soon develop a degree of skill and esthetic taste that will not only surprise us, but will be a lasting source of pleasure and benefit to both patient and dentist.

Dr. C. W. STAINTON, of Buffalo, said the use of the conspicuous gold crowns so often seen was one of the most glaring errors of dentistry to-day. They are unsightly and in no way equal to a porcelain crown, except, perhaps, as an advertisement, and for his part he thought if that object was aimed at it would be much better to send out circulars advertising his business than to disfigure the patient's mouth for the purpose.

Dr. L. S. GOBELL, of Rochester, asked what plan could be adopted for a patient who wanted a bridge from the cuspid to the second molar. The patient would not allow him to cut off the cuspid, nor could it be ground down to receive a porcelain facing.

Dr. W. W. BELCHER had put in a great many bridges in the front part of the mouth, and had not found it necessary to extract teeth nor to cut them off for abutments. He supports such bridges by means of a platinum and gold band around the tooth, and in the case of a cuspid he cuts the band away in front as much as he can, so as to expose the tooth, and make the band as little prominent as possible. The greatest art in prosthetic dentistry is that which conceals art.

Dr. JOHNSON, of Buffalo, asked how the crown of a tooth could be cut off and the pulp destroyed without causing pain.

Dr. BOSWELL answered that when a tooth was to be used to support a bridge it must be so prepared as to be permanently useful, as bridge-work is so expensive that every means must be taken to render it lasting. If the pulp is exposed, remove the crown and devitalize and remove it. In case the pulp is not exposed, mark the tooth on each side with a rapidly-revolving disk, and cut it off with excising forceps. If the pulp does not adhere to the crown, by applying carbolic acid it may be removed at once with but little pain or trouble. In crowning or banding a tooth, it is important to extend the crown or band only as far as the tooth is shaped to receive it. Many force the crown clear up under the gum, and do not get good adaptation to the root, leaving a shoulder if it is filled with cement, or otherwise a sharp edge. In either case trouble is likely to occur.

In answer to the question, How do you use carbolic acid in the removal of pulps? Dr. Boswell said that by means of a pair of fine pliers he carried the acid into the tooth and applied it to the pulp, then with a broach forced the pulp up and down in the cavity, thus allowing the acid to penetrate into the canal. There is scarcely any pain after the instant the acid first touches the pulp, and in a very short time the broach can be inserted to the end of the root, and the pulp removed. The carbolic acid causes the pulp to contract, and it is like a piece of whip-leather when it is removed, perfectly lifeless.

Dr. FREEMAN asked Dr. Boswell if he ever removed a pulp in anterior teeth by driving in an orange-wood point.

Dr. BOSWELL said yes; but it was not safe, as it sometimes caused inflammation and abscess.

Dr. FREEMAN used the orange-wood point, and afterward placed a little carbolic acid in the canal and removed whatever vestige of the pulp remained. He had never had any trouble with abscess or inflammation.

Dr. BOSWELL, replying to Dr. Gobell's question, said in such a case he would either cut off the cuspid or would refuse to make the bridge, as it would certainly have to be cut off at some time, and it was far better to do it right at first. He approved of any manner of crowning that looks well and is permanent, but objected to the use of gold crowns where they would be prominently exposed to sight.

The subject was passed, and Dr. C. W. STAINTON read a paper contributed by Dr. A. W. HARLAN, of Chicago, of which an abstract follows :

### RUBEFACIENTS AND VESICANTS.

There are many conditions requiring the use of a rubefacient, and not a few where a blister is of immense value. My opinion is that rubefaction and vesication, as remedial measures, are not taken advantage of by dentists sufficiently often to make them familiar with their objects in medicine.

What is a rubefacient? This is the definition of Dunglison : "Rubefacient ; producing redness, a medicine which produces redness of the skin. The action is called rubefaction, a gentle, local irritant. Blisters are used as counter-irritants. A blister applied for a few hours to produce this effect is termed a fly-blister. A perpetual blister is one kept open by appropriate dressing." Perhaps the simplest case of dental disease is pulpitis. Of what value would rubefaction be to the patient? Local anodynes, and even local anesthetics, often fail to give relief, and the pulp is doomed to die from lack of appropriate measures. In many cases of this nature the application of hot water to the neck and above the ear on the affected side, by means of a few thicknesses of heavy toweling (six or eight thicknesses) soaked and partially wrung out, will prove efficacious, if continued from five to ten minutes. In nearly all cases of pain around erupting third molars, the use of water about 120° F. to 130° F., covering an area of from four to six inches from the focal point, will give the necessary relief in a few minutes. The direct application of a small jet of water in the mouth on the inflamed surface is both painful and injurious, as gentle unloading of the engorged vessels is not accomplished in this manner.

For minor ills of the gums (in pyorrhea) rubefaction may be accomplished without vesication, by using a saturated solution of menthol in alcohol, or even less than this, down to a ten per cent. solution. Oil of peppermint, oil of turpentine, or oil of cloves will produce reddening, and when used over a large area will often so alter the blood-current that there will not be anything more than swelling, without suppuration. Rubefaction may be produced with chloroform, camphor, and aqua ammonia. Mustard and capsicum are also used for this purpose. It must be remembered that the object of rubefaction is to draw the blood from a circumscribed inflamed area, and fill other unstimulated points, giving nature an opportunity to recover. I have been surprised and grieved to find that rubefaction is practiced on too small a territory, not sufficient to give the desired relief. Estimated that an inflamed spot is one-half inch square, the rubefacient should cover ten times this area *in a locality which will direct the flow of the blood elsewhere*, and relieve the tension on the arteries or arterioles. In acute pericementitis, in addition to rubefaction it may be necessary to produce vesication—blistering. Many agents are used for this purpose, none of them very nicely or in appropriate places. A blister to relieve pericementitis in a superior central incisor should be made over the roots of the bicuspids, and the gingival margin of the gum, around the central incisor, should be painted at the same time with compound tincture of iodin. The blood-supply will be deflected, and the resolvent effect of the iodin will soon be felt around the apex of the root. The gum must receive at least two paintings. This rule applied to all such cases will give much cause for congratulation from your clients. Ammonia, capsicum, cantharides, or black mustard oil will produce blisters. Carbolic acid will produce a poor blister. Do not use zinc chlorid for this purpose. A blister will do no good after the formation of pus around the apex of the root. Rubefaction may do something to alleviate the pain, but a blister increases it. Rubefaction and blistering for inflammation of the gums and the peridental membrane, facial neuralgia, as well as the pulp of a tooth, will be more efficient than leeching and purging.

A modification of Mayer's hammer may be used with good effect for rubefaction. Mayer's hammer is a steel disk, which is dropped in boiling water before it is used on the mucous membrane or the skin. The one I use is about the size of a copper cent, and twice as thick, with a handle that is screwed into it while it is in the water; by applying this gently over three or four inches of space, great reddening is produced.

What the patient needs is a new sensation; this he gets with a blister or a rubefacient. When you are about to produce rubefaction or vesication, do it with your whole soul. Do it well; do not be afraid. Use blisters in inflammation, and rubefacients in congestion or stagnation. An ugly blister is not needed, as it will cause sloughing, and this is unnecessary around the mouth or on the face.

### *Discussion.*

Dr. C. S. **Butler**, of Buffalo, said the paper makes a very nice distinction between inflammation and stagnation. In practice it is not always possible to determine between these conditions. In the acute inflammatory stage the blood is coursing through the parts at a more rapid rate than usual. In stagnation the blood is prevented passing by the quantity of leucocytes that have been thrown to the parts. The use of a vesicant is to expand the vessels so the natural flow of the blood will be resumed.

Dr. C. T. **Howard**, of Rochester, said the rubefacient was an alleviator of conditions that threatened trouble, as also was a vesicant; but the trouble that indicated the use of the first was not serious except in inconvenience, while on the other hand if severe trouble, such as severe pericementitis, appears imminent, we must use a vesicant and form a blister. The use of the ready prepared capsicum plaster is so general that dentists have forgotten the use of the self-prepared remedies we used to depend upon.

On motion, a vote of thanks was tendered Dr. Harlan for his paper, and the convention adjourned.

# ACADEMY OF STOMATOLOGY.

MEETING held February 12, 1895.

## *Discussion of Dr. Darby's paper.**

Dr. M. L. RHEIN, of New York. Mr. President and Fellows of the Academy, it has certainly afforded me much pleasure that I have been enabled to be here this evening to listen to the paper read by Professor Darby. While listening to the paper, it made me feel sorry to think that he was not present during the summer at the discussion on this subject when a similar train of cases was presented before the American Dental Association, at Old Point Comfort, by Dr. Crouse, of Chicago. After Dr. Crouse had very graphically described the cases and dwelt at length upon the fact that these molars were attacked individually, precisely in the same way that Dr. Darby has illustrated in his paper, and that nothing was left to him but to extract the teeth, and that he had found this same deposit on the end of the root,—after he had taken his seat, one of the members of the association from New York took exception to Dr. Crouse's ability to observe properly, and stated that such a condition of affairs was impossible, and that what he had seen were cases of hyperostosis, and not nodular deposits on the end of the roots. I suppose what I say may recall it to the memory of those of the gentlemen who were present at that meeting. It rather provoked me at the time to reply to Dr. Abbott, because some cases of this kind had fallen under my observation, and I personally felt like verifying the accuracy of Dr. Crouse's statements that such pathological conditions did exist. That they have not been more frequently reported is unquestionably due to the difficulty in diagnosis and the too common method in which we relegate at the present time the extraction of teeth to the specialist in extraction, when we, as a rule, do not see the teeth after they have been removed. I have but little doubt that we would see more of these cases reported if we ourselves removed more teeth than we have been in the habit of doing in the past few years, instead of sending them to the extracting specialist.

Now the point that interests me particularly on this subject is the question which I brought up at that same meeting in reference to this disputed point in all our meetings,—viz, the proper nomenclature of this subject. I presented a hastily written article on the etiological classification of pyorrhea alveolaris at the last meeting of the American Dental Association, which was published in a recent number of the DENTAL COSMOS, and in that article I made the point that we had no right to depart from the beaten and accustomed track of medical science generally adopted in classifying diseases, but that we ought to follow what has held sway in all the departments of medicine, and classify strictly according to etiology, and not according to clinical symptoms. Now, my experience with all pericemental inflammation has been that the causes of pyorrhea are as prolix as the diseases that we are liable to meet with, and that the clinical results that follow vary more or less in their symptoms and appearances according to the cause. That we may meet with some much more frequently than others, and that some forms may be more common in certain sections than in others, and certain types more common in certain classes of people than in other classes, seems a very reasonable conclusion. In that article I preferred to retain for all forms of pathological conditions where there was or may have been a flow or an exudation of pus from the gingival border the name by which it is most commonly known,—that is, pyorrhea alveolaris,—and then subclassify it by adding as an adjective to any case the etiological cause of such particular case. Take, for example, the cases presented this evening. After we had defined a condition of pyorrhea alveolaris, after there had been a pocket formed with suppuration, they could be called pyorrhea rheumatica or arthritis rheumatica, according to the wish of the party describing them.

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* "Gouty Pericementitis." See page 280, current number.

I also recognize the fact that the condition of affairs existing in these cases that seem to be rather rare to us at the present time may not, after all, be so very rare, but rather unobserved. But it seems to me that cases where suppuration does not exist, where we simply have a deposit near the ends of the root that acts as an irritant, we could not call that a condition of pyorrhea. We do not have that condition present, but we do have present a condition of pericementitis which is very liable to develop into a condition of pyorrhea alveolaris. The moment we refuse to adopt a common name and subdivide it according to its etiology, we are bound to be met continually by differences of opinion in different men from different parts of the world, due to lack of understanding of the particular case under description. To illustrate a little more thoroughly the correctness of the etiological classification, last summer I spent some time in visiting the medical wards of one of our large hospitals in New York city, examining the mouths of the patients with acute febrile diseases as well as chronic diseases, from the incipient stages of typhoid fever to the convalescent stages; and also a number of cases of chronic invalids that were in various stages of treatment. In none of these cases was there found a healthy mucous membrane. I did not confine my examination to the wards of the hospital, but extended them to a large number of private rooms, where I managed to obtain the privilege of admission; patients who took a fair and reasonable care of their mouths. The point I wish to illustrate is that wherever we get a nutritive starvation, a condition of nutrition that is so feeble or so lacking in ability to support the system that there is not sufficient pabulum to thoroughly compensate for the wear and tear of the daily cell-life, the part of the tissue that is soonest to feel that paucity of nutrition would naturally be the remotest portions of anatomy, that portion of the anatomy that is reached by the remotest capillaries of the circulatory system. We certainly are aware that the capillary system supplying the peridental membrane and the gingival border along the roots is the remotest portion of the circulatory system. We know these capillaries anastomose around the margins in the gingival plexus, and it is just in that particular place that we get so much of that hypertrophied vascular condition, that inflammatory state which reminds one so much, from a clinical point of view, of varicose veins on the limbs; we often see the same congestion and purplish hue. And these conditions seem theoretically to be only the outcome of a condition of malnutrition.

In all the cases of typhoid fever that I examined there was more or less pyorrhea present. In some it was very marked. In others it was not as positive, but there was scarcely a patient in the hospital whom I examined, that on pressure I could not squeeze some mucus that was partly laden with purulent matter from the margin of the gum, and some of the mouths were entirely free from any deposits of calcareous matter. I call particular attention to this point to emphasize the necessity for this sort of classification, for if my observations are correct, we are liable to have a pyorrheal condition follow any form of disease that will depress the nutritive action to a lower standard. That is a point on which I would like to bring out a reply from the writer of the paper, especially because at the commencement of his article he devotes considerable attention to the admirable papers of Dr. Peirce on this subject, and it is merely a question whether Dr. Peirce does not attempt to draw the line too closely around a very large and much wider circle than the one form of gouty disease can possibly include.

Dr. M. H. CRYER. In Dr. Darby's paper he described an apparent abscess opening on the gum over the root of an upper molar. Since our last meeting, a patient whom I have had some eighteen years called, complaining of a second bicuspid. On closely examining it over the root, there appeared to be an abscess; in fact, it was an abscess, for I lanced it, and it contained pus, and on tapping the tooth it responded as though there was pericemental inflammation and gave the indications of a devitalized pulp. In drilling it, rather carefully at first, no response coming, I ran the engine perhaps a little fast, and the first warning I had of a live tooth the patient made a sudden jump, and I hastily removed the instrument and found blood. I examined the tooth, and I found that I had punctured a very vital pulp. The abscess was not immediately over the apex, but very closely over it. The first molar had been devitalized February 8, 1888. As soon as I found this condition, I removed the filling and the dressings from the molar and found them in perfect condition. I opened the roots a little more with drills of various kinds and probes, but could find no opening extending into the alveolar process, and I came to the conclusion that the bicuspid had nothing to do with the abscess. Knowing that Drs. Kirk, Darby, McQuillen, and Huey would meet at Dr. Darby's office yesterday, I asked the patient to call there. Dr. Darby kindly removed the dressings in each tooth in the presence of Drs. McQuillen and Huey, and I believe that they support my opinion that the abscess is at or near the apex of a bicuspid, and the bicuspid is the cause, or something associated with that tooth is the cause of the abscess. On removing the dressing yesterday morning, there was a very large flow of blood, although the tooth had been comfortable for several days, but on drawing the cotton away the blood flowed quite freely, —enough, perhaps, to fill the pulp-cavity two or three times. This blood could not come from anywhere other than from the inflamed area down through the tooth, although the pulp status is vital. I shall, of course, go on with the treatment. I am not sure exactly what treatment I shall use, but I shall watch it carefully. I don't think there is any danger of the antrum being involved.

Dr. H. E. ROBERTS. Dr. Darby makes a remark that we seldom see pyorrhea in a patient under thirty. I have a patient not over twenty-six, that I think presents the most stubborn pyorrhea I ever saw. It started two or three years ago. The two bicuspids on either side are very much affected, one of them so loose I don't know whether she will have it or not when she returns from New York. Every three or four months she puts in an appearance, and by treating the roots with pyrozone she obtains comfort. There is not much discharge of pus, and very little inflammation. I should like to know a treatment for it that will cure. Some of her other teeth on the sides of it begin to be affected in the same way. From the appearance of things she is likely to lose many teeth. I have now put her on tartarlithine, to see if that will have any effect at all. I should certainly like to find some clue or some treatment by which I could control this condition.

Dr. E. C. KIRK. I would like to speak a few words about these acute abscesses that form in relation to the gouty condition. I reported at the last meeting of the Academy some abscesses of this sort that I had observed in the mouths of patients, and also that I had very closely observed in my own mouth. Since the last meeting I have been watching these cases carefully, and they have developed one or two features which seem to me to be interesting. They are interesting as showing what may be called the mechanical factor which determines, to a certain extent, the character of pyorrhea. I have seen two cases, and one is in my own mouth, where an acute pericemental inflammation resulted in the formation of an abscess, or, more exactly, in a discharge through the gum-tissue. I would not characterize it as pus, and for that reason I question whether the condition should be characterized as an abscess. However, the inflammation resulted in the formation of a discharge upon the gum-surface. It did not break through between the root and the gingival margin, but directly out through the tissue, after which the inflammatory condition disappeared quickly and entirely.

I think we have all seen cases of alveolo-dental abscess terminate in the same way. Those which start suddenly discharge large quantities of pus, rapidly subside, and heal up without the formation of a chronic fistula. The gouty pericemental inflammations to which I refer terminated in this way.

On the other hand, I have observed cases of acute abscess such as Dr. Darby has described where the fistulous tract was established between the soft tissue and the tooth-root, where the discharge took place on the gingival margin, and a probe could be passed down almost to the apex of the root. Now, a case of gouty pericementitis which has discharged in this manner has stubbornly refused to heal up, and has continued to present an appearance closely simulating one of the forms of pyorrhea alveolaris. It seems to me that right there is an important point,—the question of whether the tophic abscess of gouty pericementitis breaks directly through the gum-tissue and then heals up, or whether it breaks along the side of the tooth, leaving a fistulous tract which opens at the gingival margin. In these cases the mechanical resistance of the soft tissues determined whether it was to result as pyorrhea or as an ordinary gouty abscess, the discharge, of course, taking the line of least resistance. In none of the cases when the abscess first broke could the discharge which took place be called pus, of the creamy yellow nature, but it afterward becomes more like pus, due, no doubt, to subsequent infection by micro-organisms from the oral fluids.

There is another feature which seems to me related to this point,—the character of the tissue in which the inflammation is expressed, as a modifying factor. Dr. Darby has drawn attention especially to the pericemental membrane as the seat of this inflammatory condition, and draws an analogy between the gouty inflammations of the pericementum and other ligaments. In Dr. Black's book upon the histology of the pericemental membrane, and more recently, he has called attention to the existence of true epithelial glandular tissue that he has found in the pericementum ; and in a later publication,—if I mistake not, it occurred in the *Dental Review*,—in criticism of Dr. Peirce's paper, he stated positively and without qualification that this epithelial glandular structure, situated in what he calls the gingival space, is the seat of pyorrhea alveolaris. Now when Dr. Black makes a statement in that manner he certainly believes that it is correct, and he has made it in the light of careful investigations, so that for our purpose we can accept that it is true. I call attention to it because it has a bearing on certain cases to which I want to call attention.

About a year ago—perhaps more—a patient presented herself to me with her incisor teeth all perfectly sound on their labial surface. Less than six months after that she presented herself for examination, and I found erosion taking place,—slight comparatively, and yet it was rapid, having all been established in the interval between her two visits, and seemed to be of such rapid progress I decided that it was best to fill these cavities. And yet the loss of enamel was of such limited extent that I remember having some difficulty in deciding whether I should or should not fill with gold. I saw her six months after that, and I was horrified to find that the fillings which I had inserted were standing up like islands in the midst of the sea, the tooth surface melted away from around them, with the enamel for a considerable extent beyond the eroded areas, chalky looking, as if it had been immersed in a dilute acid. I then began to note the general condition of the patient, and I found that she was exceedingly plethoric, full habit, florid looking, as though she might go over at any time with an attack of apoplexy ; the gums presented a turgid, engorged appearance. I called her attention to these points, and suggested that she consult a physician. As she had no family physician, I sent her to a medical man in whose judgment I had confidence, and asked him to give me a report of her physical condition. He wrote me a letter within a few days, stating that she was a marked and typical case of uric-acid diathesis, which accounted for her systemic manifestations. On her next visit I spoke to her about her uric-acid condition, and she said that she had been at Carlsbad, under treatment for it before, but she had developed either there or at some place in her continental tour a goitre, for which she was under treatment here, taking thyroid extract. Within a week or ten days afterward she came to me and said that some one had told her that thyroid extract is little more or less than a solution of uric acid, and asked, "Why should I take this solution of uric acid, if it is uric acid which is giving me so much trouble?" I confessed it was a reasonable proposition, and on her own responsibility she subsequently stopped taking thyroid extract, and went under a treatment with tartarlithine. In the course of two or three months her thyroid gland had become reduced to nearly normal, the condition of her mouth was entirely changed, and she had lost that full engorged plethoric hyperæmic appearance, and she "felt like some one else." She has been keeping up a modified anti-gout regimen, and there has been at least an arrest in the progress of her erosion.

It seemed to be a very interesting observation to find in this case the effect of uric acid upon the glandular structure of the thyroid as well of the labial mucous glands, which we now know to be the cause of the erosion; and this, in connection with the possible glandular involvement in pyorrhea, all produced by the uric-acid condition, are points which seem to me to be worthy of consideration.

Dr. RHEIN. There was a word that I wanted to add that escaped me at the time in reference to the cases Dr. Darby mentioned, and that is the treatment of these cases. I have had a little success in some of those cases by following a strictly surgical line of treatment, practically the same method that we would pursue if we had a pocket at the gingival border. Invariably I have devitalized these pulps. It is my opinion that the pulps in such teeth are better devitalized than when the teeth are left to perhaps a worse fate.

Dr. KIRK. Why would you devitalize them?

Dr. RHEIN. There are a number of possibilities. There is a possibility of uric-acid deposits in the pulp itself. To my mind, if it is possible to obtain these deposits around the periphery of the tooth which receives its supply from the same vessel that simply divides up around the end of the root, it is just as possible to get some formation that we speak of roughly as a pulp-stone, in the pulp itself, leading to some of those terrible neuralgic conditions that we meet with from that cause. At any rate, it has become a common practice with me to immediately devitalize these teeth.

Secondly, it is my custom to remove a portion of the root that is involved; if not the entire root, at least that which is involved. In a superior molar I have removed one of the three roots so frequently, and the results have been invariably so gratifying to me, that it is an operation that I look upon with a great deal of favor. There is no other tooth in the mouth that permits of such an operation with such gratifying results as a superior molar, and I want simply to point out that one method of treatment for the salvation of teeth that are attacked in this manner, especially if only one of the roots is involved.

Dr. HENRY H. BURCHARD. What Dr. Rhein mentioned as advisable to do in many cases, nature often does herself. In a paper read before the Philadelphia County Medical Society, some time ago, I assumed that in patients the subjects of the gouty diathesis the general morbid condition would be one of gradual development; that it would not have a purely volcanic action; that it would exist during some time before culminating in an acute outbreak.

In all probability there is for years a constitutional condition leading to a formation and retention of an excess of uric acid. This latter in the circulating fluids will act as an irritant, so that peripheral formative cells will be necessarily stimulated through the action of the irritant substance. Cell activity, stimulated, manifests itself in several ways. Probably the first is in a higher organization,—that is, in many parts formed material becomes harder, and so on; acting upon the odontoblasts, the peripheral cells of the pulp and they are stimulated to a greater activity, and the dentine becomes more dense. Continue the irritation long enough in the proper degree, and there will result self-obliteration of the pulp. This is an early stage of disease-action, the stimulative. The next stage in severity will be the irritative. One of the characteristics of this is altered secretion. In the discussion of a most excellent paper of Dr. Darby's, read some few years ago, Dr. Kirk advanced the opinion that the acid the cause of gouty erosion was the product of the mucous glands about the part. Dr. Brubaker has recently written upon this subject also. The irritated secretory apparatus produces altered products, acid in reaction, and these act as decalcifying agents. The third stage, following the stimulative and the irritative, is the necrotic. At this point, I really do not see why, if the loss of a tooth through—I will not call it pyorrhea alveolaris, as this term merely names a symptom, not a disease—through a progressive degeneration of the pericementum, and due to the presence of uric acid in the circulating fluids, why there should be deposits, and why pus-formation, granting that pus always represents micro-organisms, which I do not believe. If this loss of articulative tissue be a purely gouty affection, the pathology of this type of pericementitis should accord with that of gout in any other articulation. Ebstein states that necrosis precedes deposits in gout,—that is, necrosis of the tissues precedes the deposits of urates in an area. Preceding the necrosis there is an inflammation of the blood-vessels. One of the effects of this is swelling of the tunica media. In small vessels this may be sufficient to occlude the lumen, and there will be death of elements dependent upon this vessel. I forget what pathologist states that necrotic tissues in this disorder particularly have an acid reaction. The urates insoluble in acids are precipitated in this area, a chemical reaction purely. I believe in and have found the association frequently, of a gouty pericemental degeneration, which begins, not as the preceding, near the apex, but just beneath the margin of the gum. I am not yet convinced of the presence of epithelial tissue in the pericementum; but even though mucous glands are the only ones about the gingivæ, their altered secretion may serve to cause deposits from the saliva. The disease progresses then as any inflammatory degeneration. These may be gouty cases, and yet may be curable by keeping them free from deposits.

Dr. S. H. GUILFORD. This disease—pyorrhea alveolaris—expresses itself in various ways. I remember the case that Dr. Darby referred to, the first case he mentioned, because we were then neighbors, and calling upon him the very evening of the day that this case occurred, he asked me if I had ever seen a case of abscess where the pulp was alive. We thought it very wonderful in those days, and yet we would not think so to-day.

Very shortly after that there came to me at my office a negro policeman who was suffering with one of his upper molars. The tooth was loose and the gum very much inflamed. I extracted the tooth. He was one of the finest specimens of physical development I had ever seen, and yet was subject to this peculiar condition.

I kept the tooth very many years, and I think I may yet have it somewhere; it was a very unusual specimen, because of the extent and character of the deposit on the root.

Perhaps six months ago, a lady came to this city from Pittsburg. She had been under treatment there by a dentist, and as she was coming here she was referred to me. She had a very beautiful set of teeth, but around the superior left lateral incisor the gum was very much inflamed, and it was receding from the neck of the tooth. She suffered much with it, and wanted relief. I saw the case a number of times, extending over a period of several months. There was pain; there was inflammation and there was erosion; there was loosening of the pericementum, but there was no deposit at all upon the root that I could possibly find. I passed a probe time and again almost to the apex of the root, and I could not discover any evidence of the deposits. There was no flow of pus, no discharge of any kind, simply a loosening of the attachment, attended with pain, and before she left here the condition had extended to the central incisor. I advised the removal of the lateral incisors, but she decided not to have it done.

I met a physician who had charge of her afterward, and was able to learn that she was troubled with inflammation of the ovaries, and the physician had been treating her without benefit. He advised removal of the ovaries, but she was not willing to have it done.

In her case I think the tooth trouble was a reflex manifestation of the disordered condition of her ovaries,—an abnormal condition of one part showing itself very markedly in the teeth.

I mention this case particularly, because there was an entire absence of any deposits on the teeth or of pus, serum, or any discharge whatever.

Dr. A. W. DEAN. At one of the previous meetings I reported a case that has come under my care, of two lower incisors, the pocket having formed beneath the gum-margin and worked itself out to the surface. As I said at that time, I placed her under the Peirce treatment, and gave her large doses of lithia, and the case has responded very favorably; but her physician steps in now and says that she must not use lithia,—that there being a trace of consumption in the family, he is afraid that she would develop something, and he did not know what, from the use of lithia. What I want to know is whether she shall change her doctor or change her dentist. The pus has entirely stopped in its flow, and the mouth has healed up nicely. Her general health seems better. I have never before heard of any advice of that kind coming from a medical source. I asked her if she knew of any particular cause or reason for the doctor's fears regarding the action of lithia, and she said "no," but that she had been strongly advised by the physician to discontinue its use.

The case of which Dr. Roberts spoke reminds me of a case that came to me about a week ago, a young woman who had a most beautiful set of teeth. Every tooth in the mouth was in perfect condition except two lower incisors; one was hanging in the gum-tissue, and the other had dropped over and come out. She assured me that she was twenty-five, when I asked her age.

Dr. BURCHARD. Judging from what Dr. Roberts and Dr. Dean say about the ages of these patients, it would seem that too much attention is paid to that detail in regard to diseases. There is no reason why a disease that breaks out at thirty should not appear at the age of twelve or thirteen or fourteen. For instance, encephaloma has been found in a child eighteen months old; and it is a well-known rule that it never makes its appearance except in adults. These things simply teach, that there are exceptions to the general rule, and some general rules in medicine are of doubtful value.

Dr. Louis Jack. The chair has three cases bearing upon this subject, which are each of different character, that he would like to state:

Case Mr. W., left upper central. Tumefaction and abscess of gum. Pulp was alive. The patient nearly fifty years of age, of gouty diathesis, subject to neuralgia and severe headaches. The attacks have been frequent and maddening. Habit full, complexion florid. Applied for treatment with swelling of the gum over left central and lateral. Teeth but little sore. Margins of gum red, with very thin scale of black tartar beneath them. At the center portion over the middle of the central incisor root there appeared a small fluctuating spot, which when opened discharged a couple of drops of pus. The bottom of the excavation did not apparently reach the periodontium; the cavity of the abscess was defined, globular in form at the bottom, and shining. After removing the salivary calculus, the parts became restored to health. The pulps in each of the teeth were vital, and their color normal. Since then a deposit of the same character of calculus has appeared, accompanied by tumefaction of margins of the gum, but without the appearance of pus.

Mrs. N. Right upper central incisor had repeatedly presented, with tumefaction of gum over the tooth, extending from near the margin to the connection with the lip. The appearances presented the same character as the early stages of alveolar abscess, but without the usual characteristic soreness of the tooth to pressure or percussion. On testing, found it sensitive to cold. With each attack the tooth appeared to lose its healthy tinge. After many years the tooth lost its temperature sense, when, from the changes of color, some soreness occurring in connection with the tumefaction, it was decided to remove a cervical filling and drill into the pulp-chamber. I may state that the period during which this tooth was under observation was twenty years, and these attacks were not infrequent. In a moment sensibility was manifested. A year or more afterward the patient asked that the pulp be destroyed, to enable the tooth to be bleached. This was done, the pulp being found fully vital. The peculiarity of the case is this, that in many instances these attacks immediately followed the taking of wine, the patient averring that she could not use wine without an attack supervening. The patient was evidently of gouty diathesis, which at the first, which was twenty years ago, was not indicated, except by the appearance of considerable erosion of the teeth, but of late years this is markedly her condition, since the joints of the fingers show unmistakably the tendencies in this direction.

I present these two cases for what light they may throw upon the discussion of this, and also of the last meeting, upon the subject of the influence of gouty diathesis upon the tissues contiguous to the teeth.

Mrs. R. A further case of somewhat different character, but indicative of the influence of gouty diathesis upon the pericemental membrane, may be related in this connection.

A patient came complaining of reflected pain in the teeth of both sides of the face. She had several capped pulps, and while there appeared no reflection of the pain to the ear, which is an almost invariable accompaniment of pulp-irritation, I made the usual external application over them without any benefit. On her second visit the complaint was of soreness of all the teeth, which prevented her from using them at the table. An examination revealed the fact of the existence of pericemental irritation of nearly all the teeth. I advised her to apply to her physician for treatment for apparent lithemia. He confirmed this diagnosis. The patient undoubtedly possessed a strong inherent tendency to gouty disturbances, and had been treated for other gouty manifestations. Moreover, the inheritance in her case is undoubted.

Dr. WILLIAM H. TRUEMAN. It is not a subject that I have made a special study, for my inclination runs in another direction. I think Dr. Darby in his paper stated that these diseased conditions are rather on the increase. I think that the reason is that these conditions belong to middle life and beyond, and at the present time we have more patients who have reached middle life than we had twenty years ago.

I suggest to those who are especially interested in this subject that it may save a lot of threshing of old straw if they will take the literature of this subject and read what has already been published. They will find plenty of books on it. They think that dentistry is but a few years old. In 1858 there was sold in London a house that had been occupied as a dental office for nearly two hundred years. Dentistry is not a modern science. I hold in my hand a book upon the subject we are discussing—morbid conditions of the gum—published in 1722. These subjects have been considered by students of years gone by. You will find in the literature of the subject quite large treatises—text-books—which refer to the subjects which we take up as being new discoveries.

Dr. J. A. WOODWARD. A young gentleman, twenty-two years old, a high liver, of full habit, developed an excessively sore mouth, as he terms it,—that is, last spring he went abroad, and while on the continent he returned to London with this sore mouth. He fell there into the hands of a physician, and then a dentist; the latter did best. He came to me in October with one of the most inflamed mouths I ever saw. The tissue of the gum all over the mouth was inflamed. On examining the teeth carefully, there was found no tartar and no pus. The teeth were tender to pressure, and to heat and cold. I of course tried to get the mouth into a condition of cleanliness. The patient could not bear any brush; the softest brush I could get could not be borne, so I had to resort to mouth-washes and to antiseptic treatment. In despair I turned him over to one of our prominent medical men here, and that gentleman started with the same idea that I had,—that it came from the stomach or was from excessive smoking.

I examined the teeth on Saturday. I found the mouth very much improved; the swelling had disappeared, the gum had returned to its natural color. The teeth were still loose, though the man was able to brush them. I wrote a note to the physician, and this is his reply: "Mr. R.'s mouth offered a very obscure problem, and I failed to change the condition for him until I made up my mind that it was gouty."

On motion, the subject was passed.

Adjourned. GEO. D. B. DARBY, *Secretary.*

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## SECOND DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

MEETING of February 11, 1895.

Dr. W. E. HALSEY read a paper entitled "Amalgam: Its Use from a Practical Standpoint," which is printed in full at page 275 of the current number.

### *Discussion.*

Dr. F. T. VAN WOERT. I am more than interested in the subject of amalgam in the manner in which Dr. Halsey has presented it, inasmuch as it takes us back to the method recommended by Dr. Flagg, and it gives me a chance to rectify a statement giving the credit to a gentleman in Brooklyn for this method, Dr. Reese claiming it as his own. Dr. Flagg recommended the combination of phosphate and amalgam. Dr. Ottolengui and myself demonstrated that method, and can say that there is nothing in the way of amalgam work that goes farther toward making up a filling of much durability, good color, etc., than the use of phosphate under amalgam while in a plastic state. As to the mixing of amalgam, I have had decided ideas on that subject for some time. I am very sorry I didn't hear Dr. Kirk read his paper. From what I can learn, I think he has advocated about the same views that I hold.

Some three or four years ago I visited Dr. Rhein's office, and while there he was inserting two very large contour amalgam fillings. It took him a considerable time—in all, about an hour and a half or two hours—to insert them. Afterward the question arose as to whether it was beneficial to have the amalgam so dry that it could be finished at the same sitting. His original mixing was so very dry that I doubt if I could have handled it. He said he didn't believe in amalgam being put in a tooth unless mixed in that way. I think you can get better results with more mercury, eliminating the excess with the fingers or pliers. You will find that a broken surface of it, if examined under a glass, will look like that of a piece of steel, and one mixed dry will look like that of a piece of common iron of the coarsest granular consistency.

I am very glad that Dr. Kirk in his paper recommends the liberal use of mercury, and I am very glad that Dr. Halsey has come forward to reiterate what Dr. Flagg said years ago.

Dr. WM. JARVIE. The best manner of mixing the filling has been studied by almost all who have used amalgam. We have been taught to use it so plastic that it can be easily worked, and then again so dry that it is extremely difficult. Each method has had its followers at different times; but I think in a paper read by Dr. Kirk a week or so ago in New York he gave us the most scientific exposition of the proper mixing of the different materials going to make up amalgam that I have ever heard, and one which recommended itself to every one present.

As said to-night in the paper, the failures of amalgam are largely from its abuse. It is the most abused material used in dentistry. To obtain the best results from amalgam, every step in the operation requires just as much care and thoroughness as in the use of any other material to save teeth.

Now I know that every one does not agree with me in what I have said. Among those who denounced it at the World's Congress in Chicago I found gentlemen who had never used it, and did not think it a fit material to be placed in the teeth. There were some eminent men who took that position.

I am very glad indeed to have that question presented while Dr Crawford is here, because I think he is the only gentleman in the room who does not approve of amalgam. He may convert us all; we are open to conviction, and would all like to hear from him.

Dr. J. Y. CRAWFORD, of Nashville, Tenn. I would use amalgam in my practice if I thought it a proper thing to fill teeth with. I think I can accomplish better results with other materials. I believe it to be more harmful than beneficial. I could make more money plugging teeth with amalgam than with gold ; I could accomplish the result with less pain to my patient and less physical exhaustion to myself. But it is simply a matter of conviction on my part, one of those things that have gotton hold of me and I cannot throw off. I have been practicing where I am now for nine years, and I know my patients are in better condition than when I used amalgam. I think I am doing them better service than I did when I used it.

While I do not hope to convert this assembly, I am always ready to be converted to a good cause ; and if Dr. Jarvie can show me wherein I am wrong in my conviction, I am willing to throw up my hand and "acknowledge the corn," as they say down in my country.

Dr. V. H. JACKSON. When Dr. Crawford called at my office I was operating for a child about seven years old, inserting amalgam fillings. I had prepared three cavities, and the filling of them took about seven or eight minutes, the child experiencing no pain. I think in filling those cavities I put in something that will prevent decay until it is time for the eruption of the permanent teeth. I do not know what other filling I could have inserted for that little child which would have been so serviceable for the purpose.

Now in regard to amalgam, I try to place it in the cavity as quickly as possible. My fillings are hard enough to be burnished in five or ten minutes. I believe that all amalgam fillings should be inserted quickly, but have enough plasticity to be easily worked without crumbling.

Dr. J. P. GERAN. I am glad one gentleman in the room thinks a great deal as I do in regard to amalgam. We have to use it in Brooklyn, but I think many do so to excess.

Why is gold so often a failure? It is because of faulty manipulation. Why is manipulation at fault to-day? It is because of the teaching of the new departure which induced many young men newly-fledged from colleges to insert amalgam where gold and tin should have been used. If these students had been taught to use foils properly, and that they were the very best materials for preserving the teeth, they would have had a better knowledge of their working qualities, and would have more confidence in their ability to use these materials. Of course it requires finer manipulation to insert gold than it does amalgam, and it also requires more experience ; but experience is a good teacher,—in fact, the very best teacher, for by repeated efforts we improve and finally become expert.

I have no hesitation in saying that the "new departure" advocating amalgam, cement, and gutta-percha, that was sprung upon the profession ten or twelve years ago and was discussed from one end of the land to the other, did more to degrade dentistry than we will be able to recover from in another decade. It does seem strange, while so many good and true men have been and are devoting their precious time and thoughts to scientific dentistry, that simply because one man recommended putty for the conservation of the teeth, so many accepted his theory and have fallen into the pit. It is true, as Dr. Perry says, "Gold has made our profession a success," and I tell you, Mr. President, that unless there is a decided change from this wholesale use of amalgam and the teaching of its use to such an extent by its extreme advocates in institutions where the very highest skill should be taught, as a profession we will be a failure.

I will admit that many non-successes with amalgam are due to careless or sloppy work ; but it is oftener due to the amalgam than to the preparation of the cavities, or to the packing or finishing of the filling, because the amalgam invariably is subject to the laws of contraction and expansion, and by so doing makes a crevice where food will be impacted, decomposition set in, and finally caries.

I am fully impressed with the value of plastics, where it would be impossible to use gold or tin with any degree of success. Dr. Lord justly says, "That amalgam has its place as a filling-material is not questioned, but to recommend and use it as the sheet-anchor, discarding the use of foils, is something that the strongest language is too futile to condemn."

Again, I concur with Dr. Lord when he says, "I believe that if amalgam had not been used to the extent it has, we should have many more perfect operators." Our patients come to us with confidence in our skill to do and advise what is best for them, not thinking that we are going to shirk our duty by a fear of too heavy a draft on our utility. Let people begin to realize that we have arrived at the time of life when we consider our energies of more importance than what is best for their teeth, or that we are becoming afflicted with "dry rot," and then we will begin to see them deserting us for those who retain their vigor and have ambition to do the very best work.

Dr. HALSEY. If there is anything that I take pride in, it is my gold work ; but when teeth present themselves to be saved I look them over and arrive at a conclusion as to what material will best save them. Many teeth I have filled with gold, but with plastics we are able to save teeth oftentimes that cannot be saved with gold.

# DENTAL COLLEGE COMMENCEMENTS.

## VANDERBILT UNIVERSITY—DENTAL DEPARTMENT.

THE sixteenth annual commencement exercises of the Dental Department of Vanderbilt University were held in the chapel of the University, Nashville, Tenn., on Wednesday, February 27, 1895.

The charge to the class was delivered by Dr. W. H. Morgan, dean, and the valedictory on the part of the class by H. S. Peach, B.A., D.D.S., of Alabama.

The number of matriculates for the session was one hundred and thirty-six.

The degree of D.D.S. was conferred on the following graduates by J. H. Kirkland, chancellor of the university :

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| J. U. Ball | Louisiana. | J. M. Jacobs | Georgia. |
| C. S. Bingham | Mississippi. | L. H. Jeffries | Mississippi. |
| J. S. Barter | Illinois. | Y. Jones | Alabama. |
| W. D. Beckwith | Georgia. | W. T. King | S. Carolina. |
| A. D. Cage | Tennessee. | P. A. Lee | Louisiana. |
| M. A. Carroll | Alabama. | J. J. Middleton | Louisiana. |
| F. G. Campbell | Tennessee. | G. C. McKennon | Arkansas. |
| D. S. Dudley | Mississippi. | W. Z. McElroy | Tennessee. |
| C. P. Davis | Georgia. | J. A. Naftel | Mississippi. |
| C. M. Eddy | Illinois. | P. O. Patureau | Louisiana. |
| T. P. Fancheux | Louisiana. | H. S. Peach | Alabama. |
| J. A. Gholson | Tennessee. | J. R. Pirtle | Kentucky. |
| B. F. Gilmer | Illinois. | J. L. Reeves | S. Carolina. |
| F. R. Greene | Florida. | N. T. Rowland | Arkansas. |
| L. T. Govee | Texas. | W. J. Saunders, M.D. | Tennessee. |
| J. G. Glass | Alabama. | Lillie Selph | Tennessee. |
| W. S. Hanner | Tennessee. | W. H. Spurm | Louisiana. |
| S. H. Hatcher | California. | T. L. Whitehead | Virginia. |
| J. R. Hiperger | Illinois. | C. C. Winfrey | Kentucky. |

The next session, beginning the first of October, will be extended to six months.

## MEHARRY MEDICAL COLLEGE—DENTAL DEPARTMENT.

THE ninth annual commencement exercises of the Dental Department of Meharry Medical College (Central Tennessee College) were held at the Gospel Tabernacle, Nashville, Tenn., on Tuesday, February 5, 1895, in connection with those of the medical and pharmaceutical departments.

The address to the graduating classes was delivered by Rev. B. F. Rawlins, D.D., of Cincinnati.

The number of matriculates for the session was ten.

The degree of D.D.S. was conferred on the following graduates of the dental class by Rev. John Braden, D.D., president of the college : J. Abner Agnew, of West Virginia, and B. Frederic Barlow, of Texas.

## PENNSYLVANIA COLLEGE OF DENTAL SURGERY.

THE thirty-ninth annual commencement exercises of the Pennsylvania College of Dental Surgery were held at the American Academy of Music, Philadelphia, Pa., on Wednesday evening, March 6, 1895.

The address to the graduates was delivered by J. Ewing Mears, M.D., professor of anatomy and surgery.

The number of matriculates for the session was three hundred and nine.

The degree of D.D.S. was conferred on the following graduates by I. Minis Hays, M.D., president of the board of corporators:

| NAME. | STATE OR COUNTRY. |
|---|---|
| Harry Archy | Pennsylvania. |
| J. S. Ashbrook | Pennsylvania. |
| H. P. Bachman | Pennsylvania. |
| John C. Bansley | Canada. |
| Chas. R. Berlew | New Jersey. |
| F. Sloan Betts | New York. |
| Teofilo Borrero | U. S. of Colombia. |
| E. Lee Boyles | Pennsylvania. |
| H. M. Brown | Ohio. |
| Thurl E. Bullard | Maryland. |
| W. P. Clark | Connecticut. |
| E. Clarke, L.D.S. | England. |
| Jas. Cleary | Massachusetts. |
| A. J. Cottee | Australia. |
| R. S. Connor | Ohio. |
| Chas. W. Cooke | New Jersey. |
| N. J. Coyne | New York. |
| J. I. Creasy | Pennsylvania. |
| A. B. Dewees | New Jersey. |
| G. W. C. Entelrine | Pennsylvania. |
| J. E. Evans | Ohio. |
| Carl Fisher | Germany. |
| V. P. Ford | Pennsylvania. |
| H. E. Friesell | Pennsylvania. |
| Alfred Garcia | Cuba. |
| Chas M. Gowen | Georgia. |
| S. H. Griffin | Massachusetts. |
| Michael Grady | Connecticut. |
| Martin Haase | Germany. |
| J. M. Haymaker | Pennsylvania. |
| F. A. Haymaker | Pennsylvania. |
| Elwood Hay | New Jersey. |
| Geo. W. Hartzel | Pennsylvania. |
| H. G. Holch | New York. |
| W. T. Herbst | Pennsylvania. |
| H. E. Hosley | Massachusetts. |
| J. B. Hoffman | Pennsylvania. |
| R. W. Hue | England. |
| R. B. Hubbard | New York. |
| J. H. Ivins | New Jersey. |
| R. W. Jewett | New Jersey. |
| J. C. Kamerley | Pennsylvania. |
| John Krell | Pennsylvania. |
| E. H. Kuhns | Pennsylvania. |
| W. G. Lowrey | Pennsylvania. |
| A. B. Longshore | Pennsylvania. |
| Chauncy Lunger | Pennsylvania. |
| M. L. Mandelstam | Pennsylvania. |
| Geo. S. Mason | Pennsylvania. |
| L. W. McCullough | Michigan |
| J. J. F. McLaughlin | Massachusetts. |
| Howard Mellor | Pennsylvania. |
| H. C. Miller | Pennsylvania. |
| B. W. Moore | New Jersey. |
| J. W. Mountain | Connecticut. |
| W. F. O'Mally | Massachusetts. |
| Beat'ce F. Osborn | New York. |
| Seth G. Osborn | New York. |
| R. C. Phillips | England. |
| F. W. Proseus | Rhode Island. |
| W. R. Roe | Canada. |
| O. P. Roller | California. |
| Anne L. Russell | Pennsylvania. |
| Severo Salced. S. | Chile. |
| Carl Scheidt | Germany. |
| J. W. Shuman | Pennsylvania. |
| A. G. Slonaker | New York. |
| O. G. Smith | New Jersey. |
| J. F. Smull | Pennsylvania. |
| W. C. Spencer | Pennsylvania. |
| L. E. Sticker | Pennsylvania. |
| H. J. Stewart | Pennsylvania. |
| F. A. Stewart | Pennsylvania. |
| H. J. Steil | New York. |
| G. H. Thompson | Canada. |
| R. W. Turner | Pennsylvania. |
| W. H. Van Meter | New Jersey. |
| P. S. Voegtlen | New Jersey. |
| Edwin G. Warne | England. |
| Geo. L. Wernet | Ohio. |
| H. K. Wilkins | Pennsylvania. |
| R. A. Willmott | Canada. |
| M. L. Zimmerman | Russia. |

## PHILADELPHIA DENTAL COLLEGE.

THE thirty-second annual commencement exercises of the Philadelphia Dental College were held at the American Academy of Music, Philadelphia, Pa., on Thursday evening, March 7, 1895.

The address to the graduates was delivered by Professor Thomas C. Stellwagen, and the valedictory address by George Fulton Taylor, D.D.S.

The number of matriculates for the session was three hundred and sixty-seven.

The degree of D.D.S. was conferred on the following graduates by Ex-Governor James A. Beaver, president of the board of trustees :

| NAME. | STATE OR COUNTRY. |
|---|---|
| Erik G. Akerlund | Sweden. |
| Geo. C. Anderson | New York. |
| C. U. Anthony | Pennsylvania. |
| Fred Eugene Ball | Maine. |
| Arthur Laird Ball | Canada. |
| John J. Barrett | Pennsylvania. |
| George B. Beach | New York. |
| Albert O. Berg | Sweden. |
| M. W. Bieberbach | Germany. |
| Harvey R. Black | Maryland. |
| Charles H. Bogart | New York. |
| Fred'k S. Brooks | California. |
| James B. Caine | New York. |
| Richard H. Calely | Pennsylvania. |
| C. D. Candler | Maryland. |
| H. A. Carothers | Pennsylvania. |
| Theo. D. Casto | West Virginia. |
| A. D. Coleman | Massachusetts. |
| James F. Coll | Pennsylvania. |
| M. J. Collins | Maine. |
| M. B. Crisman | Pennsylvania. |
| Eliz. Cummings | California. |
| Mrs. M. E. Cummings | California. |
| William S. Dalby | British Columbia. |
| A. G. Danforth | Maine. |
| Victor E. Darling | Massachusetts. |
| Joseph I. DeRoy | Pennsylvania. |
| Wardell F. Engle | New York. |
| Geo. C. Ferguson | Canada. |
| Cassius L. Finney | Pennsylvania. |
| R. J. Fitz Simons | Canada. |
| David L Floore | Kentucky. |
| Rose Flynn | Pennsylvania. |
| John H. Foquet | Pennsylvania. |
| John W. Forssell | Utah. |
| Harry A. Foreman | Pennsylvania. |
| Harry K. Freeman | Pennsylvania. |
| Chas. C. Galloway | Iowa. |
| H. D. Gihon, Jr. | New Jersey. |
| Wm. L. Githens | New Jersey. |
| James C. Gleason | Rhode Island. |
| I Milton Hadcock | Canada. |
| G S. Hagerthy | Maine. |
| Edgar H. Hand | Pennsylvania. |
| E F Hilferty | Pennsylvania. |
| William L. Hill | New York. |
| Alvin W. Irving | Texas. |
| C. P. Jones, Ph.G. | New York. |
| A. B. Kelly, B.S. | Mississippi. |
| John P. Kelly | Massachusetts. |
| Edward A. Kent | Michigan. |
| H A Krumrine | Pennsylvania. |
| Robert M. Leslie | Montana. |
| Isidore Lett | Pennsylvania. |
| F. Lawrasor | Canada. |
| C. H. MacDonald | Massachusetts. |
| George A. Magee | Pennsylvania. |
| John W. Martin | New York. |
| Josiah Mason | Canada. |
| W. J. McElligott | Connecticut. |
| T. F. McElligott | Pennsylvania. |
| E. McKenney | Canada. |
| I. W. E. McLellan | Canada. |
| W. W. McVea | Louisiana. |
| J. W. Meadows | Canada. |
| Glen W. Means | Pennsylvania. |
| W. C. Mechem | Kansas. |
| W. H. Merrigan | Massachusetts. |
| Mrs. M. M. Moyer | Pennsylvania. |
| C. R. Murphy | Canada. |
| T. J. O'Connor | Massachusetts. |
| W. H. Owens | New Jersey. |
| Geo. E Ozias | Pennsylvania. |
| Joseph B. Page | Kansas |
| Thomas Parker | Pennsylvania. |
| Arthur Pearson | Connecticut. |
| W. J. Peebles | Pennsylvania. |
| C. F. Pepper | California. |
| Louis E Plant | Connecticut. |
| A. D. Preston | Massachusetts. |
| A. L. Puckey | Pennsylvania. |
| John F. Regan | Massachusetts. |
| E. A. Rickards | Maryland. |
| Chas. A. Riedel | Germany. |
| J. F. Robertson | Washington. |
| Peter Rogmans | Netherlands. |
| F. B. Rose | New York. |
| John F. Ross | Canada. |
| Robert E. Rose | Iowa. |
| Henry S. Russell | New Jersey. |
| C. E. Sawyer | Maine. |
| C. H. Scruton | New Hampshire. |
| W. F. Shaw | Massachusetts. |
| Stella Sims | Illinois. |
| D. G. Snyder, B.E. | Pennsylvania. |
| Rasmus Steensen | Denmark. |
| C. E. Stolte | Oregon. |
| W. H. Strangways | Canada. |
| T. R. Stuart | Canada. |
| C. A. Summers | Pennsylvania. |
| George F. Taylor | Massachusetts. |
| John A. Taylor | Pennsylvania. |
| F. J. Tewksbury | Vermont. |
| A. C. Thompson | Connecticut. |
| W. E. Travers | New York. |
| Harry V. Walls | Connecticut. |
| C. W. B. Wheeler | New York. |
| C. A. Wilbur | Rhode Island. |
| E. E. Williams | Pennsylvania. |
| James A. Witter | Pennsylvania. |
| Walter Wood | Georgia. |
| Peter H. Wood | Newfoundland. |
| James B. Woods | Pennsylvania. |
| J E. Woodworth | Wisconsin. |
| James C. Wright | New Jersey. |

## UNIVERSITY OF IOWA—DENTAL DEPARTMENT.

THE thirteenth annual commencement exercises of the Dental Department of the State University of Iowa were held at the Opera House, Iowa City, Iowa, on Monday evening, March 11, 1895.

The annual address was delivered by Professor C. S. Chase, A.M., M.D., of Waterloo.

The number of matriculates for the session was one hundred and fifty.

The degree of D D.S. was conferred on the following graduates by Charles A. Schaeffer, Ph.D., president of the university :

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| J. C. Alexander | Wisconsin. | L. G. Lawyer | Iowa. |
| Mrs. W. J. Addenbrooke | Wisconsin. | I. S. Mahan | Iowa. |
| W. J. Addenbrooke | Wisconsin. | M. B. McCabe | Iowa. |
| Grant Bruner | Iowa. | Martha S. McCoy | Kansas. |
| C. C. Colby | Nebraska. | J. A. McErlain | Iowa. |
| H. M. Eaton | Iowa. | C. A. Palmer | Iowa. |
| G. H. Edgington | Iowa. | A. O. Petersen | Illinois. |
| R. C. Grimm | Iowa. | E. A. Phillips | Iowa. |
| F. E. Hart | Nebraska. | F. J. Ruggles | Iowa. |
| F. B. Hyatt | Iowa. | J. I. Tomy | Iowa. |
| H. R. Hitchins | Iowa. | C. M. Work | Iowa. |
| P. H. Jones | Iowa. | B. E. Wright | S. Dakota. |
| W. L. Lamb | Wisconsin. | | |

## COLUMBIAN DENTAL COLLEGE.

THE third annual commencement exercises of the Columbian Dental College were held at Kimball Hall, No. 243 Wabash avenue, Chicago, Ill., on Saturday, March 9, 1895, at 2 P.M.

The opening address was delivered by S. Allen Wilson, B.S., D.D.S. ; the class valedictory by R. Fred. Throckmorton, M.D., D.D.S., and the closing address by Edward C. Nichols, LL.B.

The number of matriculates for the session was forty-eight.

The degree of D.D.S. was conferred on the following graduates by J. D. Shugart, D.D.S., dean :

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| S. G. Abbott | Wisconsin. | A. P. Lusk | Wisconsin. |
| D. A. J. Ferner | Illinois. | W. Fred. Nickel | Illinois. |
| W. Herbert Fisher | Canada. | C. H. Parker | Illinois. |
| J. E. Kraft | Missouri. | R. Fred. Throckmorton | Iowa. |
| W. E. Little | Illinois. | Albert F. Wineman | Illinois. |

# DENTAL SOCIETY ANNOUNCEMENTS.

## DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE twenty-seventh annual meeting of the above society will be held in Academy Hall, 42 N. Pearl st., Albany, May 8 and 9, 1895.

The subject for the meeting will be "Green-stain," and divided as follows :

"The Etiology," illustrated with lantern slides, etc., by Carl Theodore Gramm, M.D., Chicago, Ill.

"The Classification," W. C Barrett, M.D., D.D.S., Buffalo.

"The Therapeutics," S. B. Palmer, M.D.S., Syracuse.

Members of the profession are cordially invited to attend the meeting.

F. T. VAN WOERT, *President*, Brooklyn, N. Y.
C. S. BUTLER, *Secretary*, Buffalo, N. Y.

## ILLINOIS STATE DENTAL SOCIETY.

THE thirty-first annual meeting of the Illinois State Dental Society will be held at Galesburg, May 14 to 17, 1895, inclusive. An interesting program is in course of preparation. All dentists practicing in Illinois are especially invited to attend. A cordial invitation is extended to the profession generally. This will be the first meeting in Galesburg since 1876, and it is the hope of the officers that it will be one of the most profitable meetings in the history of the society.

LOUIS OTTOFY, *Secretary*,
Masonic Temple, Chicago, Ill.

## UNION MEETING IN BALTIMORE.

THE second union meeting of the Washington City Dental Society and the Maryland State Dental Association will be held in Baltimore, Md., April 17 and 18, 1895.

A cordial invitation is extended to members of the profession. Special hotel rates will be secured.

W. W. DUNBRACCO, *Secretary*,
1023 Edmundson ave., Baltimore, Md.

## FLORIDA STATE DENTAL SOCIETY.

THE Florida State Dental Society will hold its annual meeting at Tampa, Fla., beginning April 30, 1895. A cordial invitation is extended to all members of the profession.

S. W. ALLEN, D.D.S., *Cor. Secretary*.

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# EDITORIAL.

## "THE PHYSICAL CHARACTERS OF THE HUMAN TEETH."

WE have the pleasure of announcing to readers of the DENTAL COSMOS that the next issue will contain the first instalment of a paper by Professor G. V. Black, of Jacksonville, Ill., dealing with the above subject. The paper will embody the data and conclusions derived from a most laborious, thorough, and exact original research upon which this well-known and painstaking investigator has been at work for some time past. The research has been carried out with especial reference to its bearing upon operative dentistry. The facts brought to light furnish the basis for deductions of a highly important character. They affect many theories and hypotheses which have been for years and are still currently accepted as the correct basis of many of our operative procedures. Dr. Black's results lead him in several instances to take exception to generally accepted views respecting alterations in the density of tooth-structure by systemic causes, softening of tooth-structure during pregnancy, variations in liability to caries through changes in density of tooth-structure, etc.

Many observations based upon clinical study and popularly accredited are shown to be misinterpretations of the phenomena observed, —*e.g.*, that white teeth are necessarily soft teeth ; that the densely calcified teeth of advanced years are relatively stronger than teeth not so calcified ; that the teeth of children under twelve years of age are too soft to receive metallic fillings ; that differences in the strength, in the density, or in the percentage of lime-salts, have any influence as affecting the liability of teeth to caries ; that there is no basis for the supposition that some teeth are too soft or too poorly calcified to bear filling with gold or other metal in use for that purpose, etc.

Among the many important features of Dr. Black's work, his deductions respecting the bearing of his findings upon the phenomena of caries are perhaps the most interesting. We will not attempt to even outline this phase of the subject, as anything less than an exhaustive analysis would necessarily result in a prejudgment of the case, which we desire to avoid, and let the author of the paper present his own argument. The paper, which will occupy over one hundred of our pages, is too long to be presented in a single issue, but the first section (about fifty pages, dealing with the physical character of tooth-structure) is complete in itself; and we deem it of such importance to present that phase of the subject as a whole, that we shall add two extra forms of reading matter to the May issue, in order to give our readers the benefit of a study of the first section of the paper complete. The remainder of the paper, which will appear in succeeding issues, is devoted to the study of the physical characters of filling-materials, and all of the collected data in their bearing upon the procedures of operative dentistry.

We feel that the exhibit which Dr. Black makes will be surprising to the majority of dental practitioners ; and whether his conclusions find ready acceptance or not, they deserve the same careful, intelligent, and painstaking study which has led to their promulgation. Certainly no record of more thorough and exact scientific research in dentistry has been issued since the publication of his investigations into the etiology of dental caries by Professor Miller.

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## THE CATAPHORIC APPLICATION OF HYDROGEN DIOXID.

AMONG recent developments in the therapeutic applications of electric energy, its use for causing deep penetration of medicaments into the tissues of the body is of more than ordinary interest. A number of experimenters have shown that certain medicines when topically applied may be, as it were, driven into the subjacent tissue by the electric current. The action by which this result is effected is termed cataphoresis. That absorption of drugs by this method is greatly aided, and their effect enhanced, has been proven beyond doubt.

A most interesting adaptation of the cataphoric method to the bleaching of discolored teeth has been suggested by Mr. Wm. J. Evans, of McKesson & Robbins, the makers of the pyrozone preparations.

The method is as follows: The tooth to be bleached is prepared and desiccated, with the rubber-dam adjusted, as in the manner for ordinary bleaching operations. A pledget of cotton saturated with twenty-five per cent. pyrozone is introduced into the pulp-chamber, canal, and cavity of decay, and the positive pole of a battery of low tension, furnished with a needle-like platinum electrode, is touched to the surface of the pyrozone. The negative electrode may be held in the hand of the patient, or when mounted with a suitable platinum point may be applied to the outer enamel surface, and the current short-circuited through the tooth-structure in any desired direction. Decomposition of the pyrozone at once follows completion of the circuit, and bleaching of the tooth rapidly ensues. By applying the negative electrode to the enamel surface the bleaching effect is produced immediately under the point of contact, and can thus be brought to bear on any area of local discoloration at will. The treatment of pulpless teeth in the manner indicated is an advance over former methods, and one of more significance than may appear from a casual observation.

Bleaching of a tooth by any method which insures thoroughness of the operation is equivalent to absolute sterilization. This no doubt is attainable with pyrozone unassisted if sufficient time is taken to accomplish the result; but by means of the cataphoric action of the electric current as noted, pyrozone is driven to the ultimate ramifications of the tubuli, and its active oxygen set free by the current in direct contact with any organic *débris* which may be present as a menace to the future comfort and integrity of the tooth.

It is evident that the cataphoric method is applicable to the therapeusis of pulpless teeth by other medicaments than pyrozone, and a wide field of possible usefulness in this department will no doubt be opened up by further investigation. We have tested the cataphoric application of twenty-five per cent. pyrozone in the bleaching of teeth with most satisfactory results, which in point of rapidity and efficacy were beyond all question superior to that resulting from applications of the same material when used without the aid of the electric current.

# BIBLIOGRAPHICAL.

A TEXT-BOOK OF CHEMISTRY. Intended for the Use of Pharmaceutical and Medical Students. By SAMUEL P. SADTLER, Ph.D., F.C.S., Professor of Chemistry in the Philadelphia College of Pharmacy; author of "A Hand-Book of Chemical Experimentation," "A Hand-Book of Industrial Organic Chemistry," and Chemical Editor of the "United States Dispensatory"; and HENRY TRIMBLE, Ph.M., Professor of Analytical Chemistry in the Philadelphia College of Pharmacy; author of "Practical and Analytical Chemistry," and of a monogram on "The Tannins." Philadelphia: J. B. Lippincott Company, 1895. Price, cloth, $5.00; sheep, $6.00.

The scope of chemical science is so vast, its applications so multifarious, and its relationships so complex that an enormous literature has become necessary to give it adequate expression. The general character of its standard text-books is constantly undergoing changes necessitated by the rapid development of the science of which they are the exponents. These changes relate not only to acquisitions of new material concerning the intermolecular mutations of matter, but to the more harmonious and logical grouping and presentation of the knowledge acquired. From increased knowledge of chemical phenomena has developed the possibility of broader generalization. This in its turn has given greater impetus to scientific exactitude, revolutionized older methods, and made modern chemistry what it is to-day, the foundation of all physical science.

The new text-book by Professors Sadtler and Trimble is a notable addition to the list of chemical text-books. It is important because it is clearly the exponent of the later developments in the phenomena and of progress in the science of chemistry. Not only are the most recent discoveries relating to chemical combinations set forth, but the book is written in the spirit of the ripest scientific thought. Its classification of material and the order of its presentation is unique, and yet logically arranged in scientific relationship. The work is designed as a text-book for pharmaceutical and medical students, and the authors in the presentation of the subject have kept in view the adaptation of the matter selected to the ultimate needs of the student in the pursuit of his calling. This end has been clearly accomplished without sacrifice in any degree of a strictly scientific treatment. We know of no book in this particular field that is better adapted to its use, or which more satisfactorily meets the conditions and requirements of a text-book of this class. While designed especially for the use of pharmaceutical and medical students, it should have a place in every properly equipped dental library because of its value as a reliable and full work of reference.

MANUAL OF CHEMISTRY. A Guide to Lectures and Laboratory Work for Beginners in Chemistry. A Text-book specially adapted for Students of Pharmacy and Medicine. By W. SIMON, Ph.D., M.D., Professor of Chemistry and Toxicology, College of Physicians and Surgeons, Baltimore; Professor of Chemistry in the Maryland College of Pharmacy. New (fifth) edition. In one octavo volume of 502 pages, with 44 engravings and 8 colored plates illustrating 64 of the most important chemical tests. Philadelphia: Lea Brothers & Co., 1895. Price, cloth, $3.25.

In this work the author presents an admirable selection of material bearing upon the laws and phenomena of chemistry under seven main divisions, treating respectively of the fundamental properties of matter, the principles of the science, the non-metallic and the metallic elements and their compounds, analytical, organic, and physiological chemistry. A number of experiments are added as an aid to laboratory work, and a feature of much value is the introduction of a number of colored plates of reactions which give an accurate and presumably permanent standard for comparison of tests depending upon color reactions not easily explainable in words. The work has been thoroughly revised and brought into harmony with the new Pharmacopœia. The most modern methods for chemical examination in clinical diagnosis are given. The author's experience as a teacher of chemistry to medical classes is noticeable in this adaptation of the essential features of the science to the needs of the medical student.

CATCHING'S COMPENDIUM OF PRACTICAL DENTISTRY FOR 1894. B. H. Catching, D.D.S., Atlanta, Georgia, editor and publisher. Price, cloth, $2.50.

We have given notice to successive issues of this dental requisite as they have appeared annually. The essential features of the work are well known, and its valuable qualities so thoroughly recognized that the present issue requires no comment beyond the statement that it is fully up to the standard of its predecessors.

## PAMPHLETS RECEIVED.

Transactions of the College of Physicians of Philadelphia. Third series, vol. xvi, 1894.

Proceedings of the Academy of Natural Sciences of Philadelphia, 1894. Part III, October–December.

Die erste Jahrzehnt der Zahnärztlichen Instituts der Universität Leipzig. Von Professor Dr. Hesse in Leipzig. Reprinted from *Deutsch Monattsschrift für Zahnheilk.*, 1895, Heft 1. Leipzig, A. Th. Engelhardt, 1895.

Milk Inspection and Milk Standards. By Henry Leffmann, M.D. Reprint from *The Medical News*, February 2, 1895.

First Annual Report of the Dental Commissioners of Connecticut for the year ending November 1, 1894. Reprint from the sixteenth annual report of the Connecticut State Board of Health.

L'Art Dentaire aux Etats-Unis en 1893. Une Mission en Amérique. Rapport Addressé a M. le Ministre de l'Instruction publique sur l'enseignement et l'organisation de l'art dentaire aux Etats-Unis. Par Ch. Godon et A. Ronnet. Paris, J. B. Bailliére et Fils. 1894.

Formulaire Pratique pour les Maladies de la Bouche et des Dents. Par G. Viau. Deuxième edition. Paris, Sociéte d'Editions Scientifiques, 1895.

# OBITUARY.

## DR. WILLIAM B. LAPHAM.

DIED, at Utica, N. Y., December 12, 1894, of typhoid fever and complications, WILLIAM BAKER LAPHAM, D.D.S., in the twenty-second year of his age.

Dr. Lapham was born at Clinton, N. Y., twenty-two years ago, and early went to Utica with his parents. After a public-school education, he commenced the study of dentistry in the office of Dr. M. J. Evans, and was subsequently for two years under the pupilage of Dr. David G. Jones, of Utica, during which time he was a diligent student and trustworthy assistant He then entered the Philadelphia Dental College, and graduated, after a three-years' course, with the class of 1894.

After graduation, Dr. Lapham went to Gouverneur, N. Y., where he opened a well-equipped office, and laid the foundation for what promised to become a lucrative practice, when he was stricken with his mortal illness. Dr. Lapham was of an unusually cheerful and genial disposition, always hopeful, with a pleasing address, which made him many warm friends both in and out of the profession, to whom his early decease is an irreparable loss.

## DR. H. H. TOWNSEND.

DIED, at Pontiac, Ill., February 9, 1895, of cold and complications, Dr. HARRISON H. TOWNSEND, in the fifty-fifth year of his age.

Dr. Townsend was born at Concord, N. Y., November 16, 1840. He studied dentistry, and entered upon practice at Springville, N. Y., in 1865, but in 1866 removed to Pontiac, Ill., where for many years he continued in successful practice up to the time of his decease. He was a member of the Illinois State Dental Society, in which he held several offices, and was president of that body in 1885. He was also one of the clinical instructors of the Chicago College of Dental Surgery. In 1890 he graduated at the Chicago Homœopathic Medical College, and was a member of the Illinois State Homœopathic Medical Association.

Dr. Townsend was married October 23, 1867, to Mary E. Gaylord, of Springville, N. Y., who survives him with one daughter.

## DR. O. G. MAIN.

DIED at his home in Meriden, Conn., March 1, 1895, from the effects of Bright's disease, Dr. OSCAR G. MAIN, in the thirty-seventh year of his age.

Dr. Main's birthplace was Liberty, Sullivan Co., N. Y. When still a small boy his parents moved to Ridgefield, Conn. At the age of seventeen he entered the office of Dr. C. H. Kendall, of South Norwalk, as a student of dentistry. After a pupilage of three years he went to Meriden, in 1878, and became an assistant in the office of Dr. C. C. Barker, with whom he remained during a period of fourteen years. Nov. 1, 1892, he opened an office in Meriden on his own account, and was rapidly establishing himself as a successful practitioner, when in little less than a year ill health compelled a cessation of all labor. The following winter in Florida, and the summer and fall of 1894 at home in the north, were spent in one continued, heroic struggle against his malady, but in vain.

As a dentist, Dr. Main had few superiors. Possessed of innate skill and ability, his standards were always high, and nothing short of the best methods found favor at his hands. He was a modest and popular member of the Connecticut State Dental Association, and highly appreciated the society and fellowship of true and honorable men in his profession. He was literary in his tastes, and a warm and ardent lover of nature, never happier than when permitted to spend days or weeks with rod and reel in camp amid the Adirondacks or by some New England lake or stream.

Dr. Main was unmarried. A large circle of intimate friends who appreciated his sterling qualities of head and heart deeply regret his early decease.

C. C. B.

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# DENTAL LEGISLATION.

## BRITISH COLUMBIA'S DENTAL LAW.

FOLLOWING is the text of an act to amend and consolidate the "Act to Regulate the Practice of Dentistry in the Province of British Columbia," which passed the Assembly February 11, 1895:

WHEREAS the profession of dentistry is extensively practiced in Europe, the United States, and the Dominion of Canada; and whereas the said profession of dentistry is protected by law in Europe, the greater portion of the United States, and in parts of Canada; and whereas it is expedient for the further protection of the public that there should by enactment be established a certain standard of qualification required of each practitioner of the said profession or calling, and that certain privileges and protection should be afforded to such practitioners:

Therefore, Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of British Columbia, enacts as follows:

1. This act may be cited as the "Dentistry Consolidation Act, 1895."

2. It shall be unlawful for any person to practice, or attempt to practice, the profession of dentistry or dental surgery in the province of British Columbia who is not a member of any college of dentistry of any of the provinces of the Dominion of Canada having authority to grant certificates of license to practice dentistry; or who is not a member of any college or school of dentistry having like powers; and who does not produce sufficient evidence of such membership, and testimonials of good character; and who does not pass a satisfactory examination before the board of examiners duly authorized by this act, and pay the required fees: *Provided* that nothing in

this act shall be so construed as to prevent physicians and surgeons and others from extracting teeth, but no person extracting teeth under the powers conferred by this section, excepting properly qualified dentists, physicians, or surgeons, shall collect payment for such extracting of teeth.

3. A board of examiners, consisting of five practicing dentists, residents of this province, is hereby created, who shall issue certificates to persons in the practice of dentistry or dental surgery in this province, and whose duty it shall be to carry out the purposes and enforce the provisions of this act.

4. The members of the said board of examiners shall be appointed by the Lieutenant-Governor in Council, who shall select them from ten candidates, members of the British Columbia Dental Association, the said ten candidates' names to be submitted by the said British Columbia Dental Association. The term for which the members of said board shall hold their offices shall be five years, except that the members of the board first to be appointed under this act shall hold their offices for the terms of one, two, three, four, and five years, respectively, and until their successors have been duly appointed. In case of any vacancy occurring in such board, such vacancy shall be filled by the Lieutenant-Governor in Council from twice the number of names of members of the British Columbia Dental Association submitted to him.

5. The said board of examiners shall keep a record in which shall be registered the names and residences or places of business of all persons authorized under this act to practice dentistry in this province. The said board shall elect from its members a president, secretary, and treasurer, and shall meet at least once a year, or quarterly if required. A majority of the members of the said board shall constitute a quorum.

6. Every person desirous of being examined by the said board touching his qualifications for the practice of the said profession of dentistry shall, at least one month before the sitting of the said board, pay into the hands of the secretary the required fees, together with satisfactory evidence of the qualification and requirements of section 2 of this act.

7. To provide for the proper enforcement of this act the said board of examiners shall be entitled to the following fees, to wit: For each certificate issued to persons engaged in the practice of dentistry in this province at the time of the passage of this act, the sum of ten dollars; for each certificate issued to persons not engaged in the practice of dentistry at the time of the passage of this act, the sum of thirty dollars.

8. There shall be allowed and paid to each of the members of the said board of examiners such fees for attendance, not exceeding ten dollars per day, and such reasonable traveling expenses, as the said board shall allow from time to time; said expenses shall be paid out of the fees and penalties received by the said board under the provisions of this act.

9. All moneys shall be held by the treasurer of said board as a special fund for meeting the expenses of said board, he giving such bonds as security as the board may from time to time direct.

10. The said board at its first meeting, and from time to time thereafter, shall make such rules, regulations, and by-laws not inconsistent with the provisions of this act as may be necessary for the proper and better guidance of the said board, which rules, regulations, and by-laws shall first be published for one month in the *British Columbia Gazette*, and in one or more newspapers circulating in the province. Any or all of which rules, regulations, or by-laws shall be liable to be cancelled and annulled by an order of the Lieutenant-Governor in Council.

11. The secretary of the said board shall, on or before the fifteenth day of January in each and every year, enclose to the provincial secretary an annual report of its proceedings, together with an account of all moneys received and disbursed by said board of examiners; also a list of the names of all persons to whom certificates have been granted, and the qualifications therefor, and such list shall be published in the *Gazette*.

12. In case a charge is made against any licentiate of unprofessional conduct, or other misconduct provided for by the by-laws to be passed under the provisions of this act, the board of examiners shall have power to hear and determine the same, and for this purpose to summon witnesses before them and administer an oath or affirmation to such witnesses, and if any

licentiate shall be found guilty of the charge preferred against him he shall forfeit his certificate and title, and the same shall be cancelled, subject to appeal to a judge of the Supreme Court if brought within ten days; such forfeiture, however, may be annulled and the said license and all rights and privileges thereunder fully renewed and restored by said board in such manner and upon such conditions and terms as the said board shall think fit: *Provided*, however, that nothing in this act contained shall empower the said board to deal with any criminal or other offence provided for by law.

13. If any person after the period of three months after the passage of this act, not holding a valid certificate, practices the said profession or calling of dentistry, or dental surgery, or wilfully and falsely pretends to hold a certificate under this act; or takes or uses any name, addition, or description implying that he is duly authorized to practice the profession or calling of dentistry, or dental surgery, he shall, upon a summary conviction thereof before any justice of the peace, for any and every such offence pay a penalty not exceeding one hundred dollars or less than twenty-five dollars, to be recovered on summary conviction, and the half of any such penalty shall be paid to the board of examiners; and it is further provided that no person who is not qualified under the provisions of this act shall recover in any court of law for any work done or materials used by him in the ordinary work of a dentist.

14. The said board shall also have the power and authority to fix and determine from time to time a curriculum of studies to be pursued by students, and to fix and determine the period for which every student shall be articled and employed under some duly licensed practitioner, said term not to exceed three years, and the examination necessary to be passed before the board, and the fees to be paid into the hands of the secretary of said board, before receiving a certificate of license to practice the profession of dentistry.

15. All notices required by this act to be published in the *Gazette*, and all expenses to be incurred under this act, shall be at the cost of the board, to be paid out of the funds mentioned in section 9; in case of deficiency, to be levied by assessment against the members of the profession.

16. The "Act to Regulate the Practice of Dentistry," Chap. 34, Consolidated Statutes, 1888, is hereby repealed.

# PERISCOPE.

GOUTY PAROTITIS.—At a recent meeting of the Society for Clinical Research, Philadelphia, Pa., Dr. Debout d'Estrees gave the following description of two interesting cases of gouty parotitis:

"A gentleman, sixty-three years of age, who came every year at Contrexéville to obtain, as many of our countrymen, immunity from the evils of his future excesses, called me to Paris in consultation with Dr. Buequay, a member of the Academy of Medicine. He told us that after a long sitting the previous day at his dentist's, he was seized during the night with an intense pain in the region of the right parotid, which was hot, red, and swollen. No external application having brought relief, I suspected in that case gouty interference. However, as I could not find anything in the most recent treatises on gout, and as my friends or masters, among whom I consulted Charcot, who wrote much about gout in former times, could not give me any information on the subject, I was obliged to agree with my colleague in the diagnosis of an abscess of dental origin, which would probably necessitate surgical interference; but when we visited the patient two days later the parotid was flat, and a regular fit of gout had invaded the left knee.

"When I saw this gentleman again in July at Contrexéville, two months after the first consultation, he told me that gout invaded successively the left parotid and the right knee before leaving him. He felt well then, but complained of a very disagreeable salty taste in the mouth at the beginning of each meal. When in examining the patient I pressed upon the parotids, I at once excited the salty taste, which I could later demonstrate was produced by saliva loaded with urates, the epiphenomenon of the gouty attack.

"I had, in July, 1887, another occasion to see a case of gouty parotitis, in a man of fifty-four years of age, having been called in consultation by one of my colleagues at Contrexéville. In this case the attack of the parotid was preceded by an attack in the wrist of the same side. As my colleagues had already used, without success, external applications, I did not hesitate to use internal remedies, and prescribed tincture of fresh flowers of colchicum, fifty drops three times in twenty-four hours, and with each dose twenty-five centigrammes of sulfate of quinin. This treatment proved successful, as the patient was able, forty-eight hours later, to take the train to Paris, where he was urgently wanted.

"I never saw other cases by myself, but I have collected a dozen, all unpublished, from Drs. Rotureau, Labadie-Lagrave, Boichox, Damaschino, and Goyard, in France, and Sir Alfred Garrod, Sir Dyce Duckworth, Sir Oscar Clayton, and Stephen Paget in England."—*University Medical Magazine.*

THE SUPPRESSION OF THE NOSTRUM TRAFFIC.—In contrast with the efforts on the part of some members of the American Medical Association, as representative of the medical profession, to exorcise certain salutary restrictions from the Code of Ethics, are the numerous indications of a disposition on the part of the dental profession to elevate its standard both ethically and educationally While certain men in the medical profession look upon nostrums with indifference, if not with encouragement, the dentists are discussing measures for the suppression of unethical practices of all kinds.

In a paper read some time ago before the First District Dental Society of the State of New York, Dr. E. C. Kirk, of Philadelphia, showed that a large number of nostrums recommended for the relief of various painful affections of the teeth and gums contained cocain, despite the emphatic assertion to the contrary in most instances. The danger of the indiscriminate use of such preparations in unskilled hands is entirely too obvious to require extended comment, and calls for restrictive legislation of some sort. The DENTAL COSMOS in its February number notes editorially that a movement has been set on foot in Mississippi having for its object the prohibition by legislative enactment of the use of nostrums in connection with the extraction or filling of teeth. The agitation is a timely one, and should find the most cordial indorsement and support wherever intelligence and honesty prevail over ignorance and quackery. The restrictions in the use of dangerous remedies or such as are not what they are pretended to be, should, however, not be limited to any one class or variety, but should be extended to include all preparations the nature of whose composition is concealed. Dentists and physicians might well join hands in support of such salutary legislation and institute measures looking to its enactment and enforcement.—*Medical News.*

DANGER IN COCAIN.—Though cocain has been known as a valuable agent for some years, the number of so-called secondary or amorphous alkaloids remains yet a subject of doubt to chemists. There are known to be several, and recent researches on the part of Liebermann, Liebreich, and others prove that one of these amorphous alkaloids,—viz, iso-atropyl-cocain,—is a most violent cardiac poison. This alkaloid occurs in coca-leaves in very minute quantity, as a rule, but some specimens contain far more than others; its separation is most difficult, and it enjoys the reputation of being the least easily detected of all the coca bases. Even if we were not positive that the secondary bases exhibited a pernicious effect, they must be looked upon as suspicious, and a cocain demanded from which they are removed. As a matter of fact, we do know that the presence of even small quantities of these amorphous bases is responsible for untoward and seemingly inexplicable results that often follow upon the administration of supposedly pure cocain preparations.

Recently the editor of the *Medical Age* learned of two apparently mysterious deaths which were in reality the result of the use of impure cocain by dentists for its benumbing effect in the extraction of teeth; in both cases the drug was injected into the gum. In one instance death occurred within a few hours after the teeth were drawn; in the other the lady lingered for about thirty-six hours, and all the resources of the medical art were unable to stimulate a heart that had been fatally poisoned owing to a preponderance of iso-atropyl-cocain.

Such facts as just cited should prove sufficient to put the practitioner on his guard and induce him to demand a cocain that is free not only from secondary alkaloids, but from such inorganic substances as sodium, calcium, etc., that are necessarily employed in the process of manufacture.—*Medical Age.*

Iodoform as an Antiseptic.—Professor Miller, of Berlin, and Mr. Mummery showed at dental meetings a few years ago specimens of bacteria flourishing in the immediate vicinity of iodoform crystals. Several attempts have been made to explain how under such circumstances iodoform gives such good results, clinically, as an antiseptic. Some experiments recently performed by M. Stchegoleff with the staphylococcus seem to throw some light upon the question. This micro-organism flourishes in an iodoformed culture-medium, although when inoculated after the action of the drug it is inoffensive. Animals inoculated with the staphylococcus grown in ordinary media suffered with abscesses or died from septicemia. Two kinds of culture were prepared, one normal, the other mixed with ten per cent. of iodoform. Both were filtered at the end of a week to free them from living organisms, and then rabbits were inoculated with the toxines produced by the organisms and left behind. The animals inoculated with the iodoformed toxine remained well, whereas the others died. The supposition, therefore, is that under the influence of iodoform the toxines of the staphylococcus are converted into non-poisonous iodized compounds.—*British Jour. of Dental Science.*

Chronic Stomatitis followed by Death.—Dr. K. Winkelmann relates the case of a man of forty-six years who, without apparent cause, was attacked with an exceedingly painful vesicular eruption of the right half of the tongue. The vesicles left behind them ulcerations which, in spite of all efforts to cause cicatrization, by means of antiseptic solutions, cauterization with nitrate of silver, and the internal administration of potassium iodid, on the hypothesis of a syphilitic origin, increased to such an extent as to involve the mucous membrane of the gums, mouth, and lips. These ulcerations were superficial, not indurated at the base, and bled at the slightest touch; they varied in size from that of a lentil to that of a pea. Ptyalism was present, but the submaxillary ganglia were not swollen. The urine contained neither sugar nor blood.

The condition of the patient grew slowly worse, and there appeared upon the skin of the feet and legs numerous petechiæ not larger than the head of a pin. The ulcerous process now invaded the pharynx and even the larynx, diarrhea supervened, with symptoms of febrile bronchitis, and the patient died from exhaustion six months after the onset of the affection. A postmortem was not permitted. Bacteriological examination of the mucous membrane during life showed the presence in the ulcerations of a microbe analogous to that of alcoholic fermentation, capable of culture in almost all media, and similar to that isolated by Siegel in the course of an epidemic of aphthous disease of cows which had raged among men and animals. Winkelmann believes that his case was of the same nature, although the patient could not remember having been brought in contact with cows suffering from the affection, and although inoculations of the microbe into animals gave only negative results.—*Universal Medical Journal, from Deutsche Zeitsch. f. Chir.*

A Case of Otitis Media Purulenta with Caries of the Mastoid Process due to Caries of the Second Molar.—Schwartz (*Arch. of Otol.*, xxii, 2) reports a case of this kind in a young man aged twenty-one years. The caries was transmitted to the upper jaw, whence the fistula occurred in the hard palate, and this was readily closed after the removal of the tooth. Thence the poison affected the periosteum and simultaneously the mucous membrane on the left nasal floor. The periostitis extended from this region through the Eustachian tube into the tympanum and osseous portion of the external meatus, and formed a circumscribed and hemispherical infiltration, corresponding with the tympanic opening of the Eustachian tube, which at first resembled a genuine exostosis.—*New York Med. Journal.*

Granulated Effervescent Bitartrate of Lithia.—In a paper on the "Dental Manifestations of Gout" recently published in this journal, Dr. E. C. Kirk, of Philadelphia, U. S. A., points out the value of lithium bitartrate in the treatment of this malady. In seeking for some constitutional remedy for the abnormal condition of the labial mucus he was led to select bitartrate of lithia, the organic acid radical in which would serve to produce an alkaline reaction of the secretions, particularly of the urine, while the lithium would enhance the solvent power on uric acid. Dr. Kirk was so satisfied with the use of this salt that he was impelled to call attention to its value in the hope that the well-known prevalence of gouty affections in England might afford a field for a wider and more complete study of the therapeutic possibilities of this drug, and at the same time to acquaint others with what so far appears to be its strongly-marked value in the treatment of disorders dependent upon the uric-acid condition. The promptness of its action is in many cases, observes Dr. Kirk, astonishing, a subsidence of distressing symptoms quickly following an administration of three doses of five grains each, taken four hours apart in a half-pint of water on a reasonably empty stomach. This has suggested the preparation of a granular effervescent bitartrate of lithia (containing five grains to the dram), a specimen of which Mr. Bishop has recently submitted to us. The preparation is agreeably effervescent and pleasant to take, while a chemical examination deduced both the proper quality and quantity of the lithium salt. The results obtained by Dr. Kirk will doubtless induce many to exhibit this remedy in the pleasant form which Mr. Bishop has succeeded in producing so satisfactorily.—*The Lancet.*

Anesthesia.—At the twenty-third congress of the German Surgical Society Geheimrath Gurlt read the yearly report of the collective inquiry into the statistics of anesthetization. The report embraces 51,846 narcoses of the year 1893, of which 32,723 were produced by chloroform, 11,617 by ether, 3896 by chloroform and ether, 750 by chloroform, ether, and alcohol (Billroth's mixture), and 2769 by ethyl bromid. A number of laughing-gas anesthetizations are added. These 51,846 surgical narcoses count twenty deaths, and of these, again, seventeen are after chloroform. Thus, the average proportion was one death to 2587 narcoses and one death to 1924 chloroform narcoses. In the four years during which the inquiry has been carried on, only one death after ether has been noted, and, accordingly, the use of ether has increased from 6200 cases in 1892 to 11,600 in 1893. The chloroform-ether mixture was used 1200 times in 1892 and 3800 times in 1893. Pictet's chloroform (purified by exposure to extremely low temperature) was used 3182 times, as against 708 in 1892. In spite, however, of this and other purified chloroforms at present in use, death during chloroform-narcosis has not proved preventable, and the general opinion now is that it is not caused by the chemical impurities contained in ordinary chloroform.—*British Medical Journal.*

Local Anesthesia in Minor Surgery.—Dr. v. Hacker (*Hygeia*, No. 9, 1894), in a recent paper read before the Viennese Medical Society, called attention to two methods of producing local anesthesia which he has found of service in minor surgical work. The first is Schleich's method of causing local anesthesia by infiltration. A 0.2 per cent. solution of sodium chlorid, injected under the skin, will bring about an absence of feeling in the injected area. If this action is to be increased, a little cocain may be added. The speaker employed a 0.1 per cent. solution of cocain in a 0.2 per cent. solution of common salt. Of this preparation ten hypodermic syringefuls contain one centigram (1/6 gr.) of cocain. Much depends upon the technique of the injection. Several syringefuls should be thrown under the skin, so that an edematous infiltration takes place. Small and elevated whitish vesicles will appear, which are an assurance of anesthesia sufficient for small operative measures. He was decidedly satisfied with his results, and he gave the details of several of his cases where he used from one-half to ten syringefuls of the solution. Among these were removal of a needle from under the finger-nail, operation for ingrowing toe-nail, cauterizations for nevus, angioma of the lower lip, removal of atheromata, operation for phimosis, operation for an epithelioma of the lower lip, excision of a tuberculous ulcer of the forehead, and extraction of an upper molar tooth. In major operations he would reject this method entirely. Operations for purulent osseous lesions and periosteal felons are not to be operated without pain under this method. A long and fine needle is necessary, which may be thrust under the skin, the fluid injected and the needle partially withdrawn and thrust in again, so that a large area may be infiltrated through one place of puncture. This method is absolutely devoid of danger.

The second measure is the employment of ethyl chlorid as a spray to induce local anesthesia. He finds it excellent in opening boils, operating on ingrowing toe-nails, and especially in operations on inflammatory and purulent affections of the fingers. He employed the glass tubes. The tip is to be broken off with a needle-holder, after which the warmth of the hand will cause the fluid to spurt forth in a very fine stream, and, evaporating upon the skin, produces anesthesia by production of cold. The end of the tube is held first near and then quickly removed to ten, twenty-five, or forty centimeters' distance from the skin. If held too close to the skin it will become wet, and the anesthetic will not evaporate, but run off in drops. It should be allowed to act for fifteen to thirty seconds, when the skin will turn as white as snow, become hard, devoid of feeling, and seem to be covered with a hoar frost. If a deep incision is to be made, the whole contents of the tube must be used ; otherwise from one-half to one-third will suffice. Its action is quite short-lasting, and everything must be ready for the incision before beginning to anesthetize.—*Cincinnati Lancet-Clinic.*

INFANTILE SCURVY.—In a clinical lecture at the Jefferson Medical College Hospital, Dr. Edwin E. Graham described a typical case of infantile scurvy, and stated that contrary to what might be expected the disease was more often seen among the children of the well-to-do than among those of the poorer classes, owing to the fact that the children of the poor receive often articles of table food, as meat, potatoes, and fruit, while children of the wealthy are too often not raised at the breast, but given constantly one of the many largely-advertised patent infant foods. Many of such preparations, while of benefit temporarily, may, if constantly used, produce scurvy.

The causation of the disease is always the same : artificial feeding and the giving usually of one food for a prolonged period.

The main symptoms are swollen, spongy, and bleeding gums, with swelling of the lower limbs, generally the thighs, the skin being tense and shining, but not pitting on pressure.

Epistaxis, spots of ecchymosis, bleeding from slight fissures, as of lips, and hemorrhages from mucous membranes, are often present. The swollen limbs are excessively sensitive to touch, and a pseudo-paralysis of the lower extremities is not uncommon. It is often found associated with rickets. The disease is probably due to some chemical alteration in the blood. Dr. Northrup describes scurvy as a condition of malnutrition affecting the capillaries, thus allowing the blood to escape from the vessels, and producing gingivitis or spongy gums. Infiltration of serum and blood occurs in the muscles, and beneath the periosteum of the long bones, the femur especially.

In the treatment, diet is of the first importance. Orange or lemon juice, with beef juice, beef tea, broths, and the appropriate treatment of any intercurrent affection, as for instance gastro-intestinal disorders or a condition of rachitis, will usually, even in the worst cases, be followed by cure. The rapid improvement following antiscorbutic diet, the condition of the gums, the fact that the swelling is not articular, should prevent the mistaking of the disorder for rheumatism.

The disease has not been observed in breast-fed babies under one year of age. The occurrence of the disease before the appearance of the teeth is altogether exceptional, although Dr. A. Jacobi has seen typical spongy gums in a bottle-fed child six months old, in whom dentition had not occurred.

Scurvy is more often met with in children between one and two years of age than at any other period.

The disease is readily curable under appropriate treatment.

# HINTS, QUERIES, AND COMMENTS.

Treatment of Antral Disease.—In a clinical lecture on disease of the antrum of Highmore, at the New York Polyclinic and Hospital, Professor John A. Wyeth said, "I advise you, in the treatment of these cases, to leave the teeth alone if possible, in spite of the fact that nearly all of the text-books tell you to extract the second molar tooth. You can get as good drainage without destroying a useful tooth by operating in the way I have suggested, as follows: Enter the antrum through the buccal cavity just above the root of the second molar tooth at the point where the wall of the cavity projects prominently. After throwing in a few drops of a four per cent. solution of cocain, a hole can be bored into the antrum by means of a small hand-drill, and you can then introduce a probe and learn whether the disease is the result of osteitis or a polypus, or ozena which has extended from the nose. You are then, too, in a position to treat the cavity, and restore its normal function. You can wash it out as frequently as you deem necessary with boric-acid solution, or peroxid of hydrogen, or with anything else which you think is effectual in your experience. I do not know of any class of cases that are more difficult to treat than these which are usually the result of osteitis of the upper jaw. If allowed to go untreated, the inflammatory process may find its way through the thin wall of the cheek, forming ugly sinuses; or it may break through into the posterior nares, which is perhaps the better way, although it does not result in cure. It is very rare to find two cases that behave alike."

Steresol.—In a communication to the French Academy of Medicine, in June, 1893, M. Berlioz, of Grenoble, described an antiseptic varnish designed for application to the mucous membranes and the skin in the treatment of certain inflammatory conditions of those tissues. An extensive trial of the preparation in several of the hospitals of Paris, and by practitioners in private practice, has demonstrated that steresol is a most valuable therapeutic agent.

The object aimed at in the production of steresol was to secure an easily applicable antiseptic dressing, which should possess the property of adhering to moist or denuded mucous surfaces, acting as a protective covering against reinfection, and at the same time exerting a sterilizing effect upon the protected surface. It was desired also to avoid all caustic or irritating effects, and at the same time induce a sedative or even local anesthetic impression.

After numerous experiments, the following preparation was found to combine the qualities and properties sought for:

Purified gum lac, 270 gms.;
" benzoin, 10 gms.;
Balsam of tolu, 10 gms.;
Carbolic acid, crystallized, 100 gms.;
Oil Chinese cinnamon, 6 gms.;
Saccharin, 6 gms.;
Alcohol, q. s. to make 1 litre.

The use of carbolic acid in the strength solution above given (10 per cent.) is found to be non-irritating, and to produce a decidedly local-anesthetic effect. The antiseptic feature of the carbolic acid is reinforced by that of the saccharin.

Both chemical and bacteriological tests of the preparation have been made, which show that it has high antiseptic value, and that its activity when applied to mucous surfaces extends over a period of at least twenty to twenty-four hours.

In dental practice steresol is applicable in treatment of inflammatory conditions of the mucous membrane and gum-tissues, ulcerations, aphthæ, mercurial stomatitis, gingivitis, difficult eruption of third molars, treatment of pyorrhea alveolaris, etc.

In the treatment of pyorrhea pockets the preparation seems to be of especial value ; a thorough painting of the surfaces after removal of concretions, deposits, etc., exerts a most soothing and beneficial effect upon the soft tissues, and furnishes an effective barrier against reinfection of the parts by microorganisms in the oral fluids.

The preparation is of thin, syrupy consistence, and dark brown color. The color depends largely upon the grade of gum lac used in its manufacture. By using the best grade of purified or bleached lac a lighter preparation results, which when applied to the skin is not especially noticeable.

We are indebted to an article by Dr. Edmond Papot in *L'Odontologie* for the details concerning the manufacture of this preparation, which a limited experience in its use leads us to recommend to the favorable consideration of the dental profession as a useful medicament, especially in the treatment of pyorrhea cases.—EDITOR DENTAL COSMOS.

A CURIOSITY IN DENTAL CHEMISTRY.—In repairing a plate having plain teeth soldered to a gold base, and an artificial gum of pink rubber, the fixture was immersed in sulfuric acid (commercial) and allowed to boil ; after this the plate was heated and the rubber detached. The repair tooth was soldered to the plate, and the fixture was placed in a one to ten solution of sulfuric acid in a copper cup and heated. For a few seconds it boiled quietly, when suddenly there was a violent ebullition of the solution, attended by the evolution of $H_2S$, and the solution became almost black. After washing the plate in water, there was found a slight amalgamation of part of its surface, and a coloring substance resembling carmine was found in some of the interstices. The only source of mercury possible was the vermilion used in coloring the pink rubber; but as the case was heated to at least 1600° F., it seems strange that this was not entirely decomposed and the mercury volatilized ; but there it was, with some coloring-matter, in addition to the spots of amalgamation. The reaction liberating the $H_2S$ was doubtless as follows : The sulfuric acid of the solution, acting upon the vermilion, decomposed it,—thus, $H_2SO_4+HgS=HgSO_4+H_2S$,—giving sulfate of mercury and hydrogen sulfid. The precipitation of the mercury no doubt resulted from decomposition of the mercury salt by the metallic copper of the containing vessel. Its precipitation upon the gold plate was probably determined by galvanic action, the elements of the galvanic couple being the gold plate and the copper disk, and the electrolyte being the acid solution of mercuric sulfate.—H. B.

COCAIN A POISON.—The evidence to prove cocain a poison is now so ample that no excuse will avail to exonerate the doctor who, not heeding the lesson taught by the gruesome record, fails to use it with the care its toxic energy demands. It is a drug peerless for good in certain conditions, but its power for ill must never be lost sight of, if one would conserve the best interest of those on whom it may seem wise to use it.—J. B. MATTISON, M.D., in ***American Medico-Surgical Bulletin.***

A Method of Adjusting the Logan Crown.—Having prepared the stump, drill a series of small holes as near the circumference as possible. Cut these together, and you have a groove for the reception of band, as shown at A, Fig. 1. This band should extend to the bottom of the groove, say one-sixteenth of an inch; then grind the band level with the face of the stump. Cut a disk from 29 gauge gold plate, Fig. 2, D, fit over the root, burnishing thoroughly; remove the band and cap and flow a very small quantity of solder to unite them. You can readily see how to replace the disk on band. Replace the soldered piece and drill or puncture for the reception of the pin, and adjust your crown. You can remove and place the cap on the crown and flow a small quantity of solder around the pin, making it all one piece, or cement without soldering.

If it is desirable to work from a model, take an impression, after the groove has been cut in the root, with Melotte's compound, and make a metal die, as shown in Fig. 3, C, and proceed as before. I claim for crowns adjusted in this manner that they are less bulky than the ordinary band crown, absolutely cleanly, no trouble from pericementitis, and no gold will show. I think the profession will appreciate this way of setting Logan crowns.

Fig. 1.

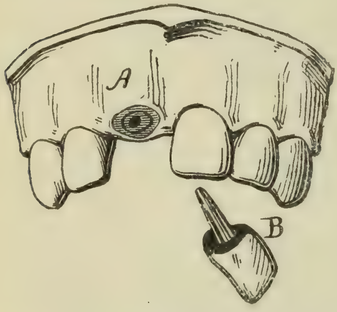


Fig. 2.

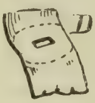
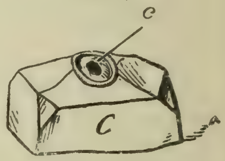


Fig. 3.



Dr. Crossland uses a band of this character for porcelain-face crowns, and reports satisfactory results.—T. M. Jamison, Houston, Miss.

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# LIST OF UNITED STATES PATENTS
## PERTAINING OR APPLICABLE TO DENTISTRY
### ISSUED DURING FEBRUARY, 1895.

*February* *5*.—No. 533,445, to F. N. **Dennison**. Electric dental motor apparatus.
" " No. 533,560, to **John S. Sanger** and R. M. **Sanger**. Apparatus for applying tooth-powder.
" " No. 533,573, to **John D. Wilkens**. Dental bur.
" " No. 533,574, to **John D. Wilkens**. Dental hand-piece.
" " No. 533,575, to **John D. Wilkens**. Dental hand-piece.
" " No. 533,738, to B. F. **Philbrook**. Dental tool.
" *12*.—No. 533,862, to W. A. **Brabrook**. Toilet flask.
" *19*.—No. 534,374, to O. K. **Pieper** and A. F. **Pieper**. Electrical apparatus for operating dental instruments.
" " No. 534,536, to W. E. **Wheeler**. Electrically-operated dental engine.
" " No. 534,540, to W. F. **Wooster**. Dental disk-holder.
" *26*.—No. 534,841, to **Henry C. Register**. Dental engine.
" " No. 534,849, to **Edward H. Angle**. Art of regulating teeth.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

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# ORIGINAL COMMUNICATIONS.

## AN INVESTIGATION OF THE PHYSICAL CHARACTERS OF THE HUMAN TEETH IN RELATION TO THEIR DISEASES, AND TO PRACTICAL DENTAL OPERATIONS, TOGETHER WITH THE PHYSICAL CHARACTERS OF FILLING-MATERIALS.

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THIS subject, so far as it relates to caries of the teeth, has, it is believed, never been subjected to scientific inquiry. The ancient idea of medical men was that caries of the teeth was the result of inflammatory processes taking place within the structure of the tooth. With the advent of the chemical theory of caries it was almost immediately blended with that preceding it, so that it was in a sense made a part of the older theory of the causative influence of inflammation; the condition of the tissues of the tooth still, as interpreted, played an important rôle in the production of caries. In the course of years the interpretation gradually passed from the inflammatory hypothesis to the hypothesis of a lack of lime-salts in the tissues of the tooth as the factor favoring caries. In the more recent investigations of Miller, of Berlin, and others, which have unfolded the rôle played by micro-organisms in the production of caries of the teeth, little attention has been given to the immediate condition of the tissues of the tooth acted upon. It may now be said that the hypothesis that the condition of the tooth-structure, in a large degree, renders the tooth susceptible or unsusceptible to caries exists in full force in the minds of a large proportion of the members of the dental profession. We see constantly in dental literature allusions to "frail teeth," "chalky teeth," "hard teeth," "soft teeth," "dense teeth," that this patient's teeth have become soft and are melting down rapidly; or that that patient's teeth are hard and firm in structure, etc. Also we read frequently of the selection and adaptation of filling-materials to teeth that are "frail in structure," or to "soft teeth," and of the adaptation of filling-materials to hard, firm teeth, etc. In a search of the literature for the basis upon which this idea of the differences in the condition of the tissues of the tooth rests, it is found to be an interpretation derived from certain clinical appearances. It often happens that the teeth of certain persons have manifested little or no tendency to decay for years, and then, almost without warning, rapidly progressive caries attacks a considerable number at once, melting them down rapidly. The interpretation is, that such teeth have become soft. This has been especially noted in pregnant and nursing women ; in persons from other countries who have located in the United States ; and in persons of certain employments, especially candy-makers, millers, bakers, etc. In these also the teeth are said to become soft, and therefore decay rapidly. Also the idea is prevalent that such teeth have, in some way, lost lime-salts ; have, in a word, become less dense in structure.

As to the facts of the occurrence of this rapidly progressive caries, where little or none had existed before, there can be no question. Every observant dentist of twenty years' practice has noted many such cases. Also, many cases are observed in which caries has progressed rapidly for a time, and then practically ceased ; or has become easily controlled by the usual means. The question at issue in this investigation is not as to the occurrence of the conditions represented by rapidly destructive caries. These cases occur as represented. But the question presented here is the one relating to the supposed change in tooth-structure,—the hardness, or density of the teeth, before or contemporaneous with this melting down by caries. Does this softening of the structure of the tooth occur otherwise than by the direct action of the carious process, and if so, in what degree?

Two well-known facts have seemed to argue against the interpretation that the clinical appearances mean soft, or softening teeth. First : the teeth are the hardest structures of the body, and are of the lowest vital endowment as to self-repair, and are therefore the slowest in vital changes. Second : caries, according to present accepted theories, attacks the teeth from without, acts upon the teeth beginning upon the outside, and presumably the physical or vital condition of the teeth themselves has little to do in the case. Both of these propositions, if admitted, seem to argue that this melting down of the teeth is dependent on some factor or factors outside of and practically independent of the physical or vital conditions of the tissues of the tooth. The question as to the truth of these propositions will be a principal subject for instrumental determination.

In thinking upon this subject, in watching the literature, and in my teaching from year to year, I had become more and more dissatisfied with our knowledge of the physical characters of the teeth, and of the relation these held to their diseases ; and also, I had the same dissatisfaction with our knowledge of the physical characters of the filling-materials in use, and their relations to the strength of the teeth, and to the force of the occlusion of the jaws. For several years I had contemplated subjecting this whole subject to rigid experimental inquiry ; but had been held back by the pressure of other matters, and the knowledge that it would be a long and laborious task to make it sufficiently complete to render the findings available for the improvement of our practical operations, or furnish a reliable basis for future studies. For these purposes it was thought that isolated experiments, however interesting, would be of little value; but that it would require a connected chain of experimental study, connecting fact with fact from beginning to end as completely as our present knowledge and facility in instrumentation would permit.

The objects of the investigations here detailed, so far as they relate to the teeth, are to find the truth if possible, as to the differences in the density, percentage of lime-salts, strength, etc., occurring in the human teeth, and to find what relation, if any, such differences may bear to dental caries and other diseases of the teeth.

The object of the investigation of the relation of the physical strength of the teeth to the strength of filling-materials, and the force with which the jaws are brought in occlusion, is to find such factors, or laws, as will enable us more perfectly to adapt filling-materials so as to afford the needed resistance to the stress of mastication, and its attendant accidents, such as catching a small, hard object between the teeth or on a filling, etc.

In this effort, so far as it relates to the teeth, there is no scientific work, or record, by which to be guided, and the investigation must proceed *de novo*. Certainly we know from experience that dentine has about a given density, that it contains about such a percentage of lime-salts, etc., and that the differences reported by persons who have made these examinations give the idea that these proportions are somewhat variable; or that the difficulties of the examination are such that different results have been obtained. Now, the questions to be determined are, What have such variations in the density of the teeth, if any exist, to do with dental caries and other diseases of the teeth? What relation does the density bear to the strength of the teeth? What is the relation of the strength of the teeth to the strength of filling-materials? And, what are the combined strength relations of these, to the force of the occlusion of the teeth in their ordinary use in mastication, and in the frequent accidents of catching hard particles between the teeth, or upon fillings?

In entering upon the work, the first question to be determined was, Are differences in the density of the teeth sufficient to be measured by well-constructed scientific instruments? And, if so, to determine the kind and quality of the instruments necessary for their determination. An examination of the subject with this view developed the fact that the differences in the density of the teeth are extremely limited, so much so that the most delicate instruments would be required for the successful prosecution of the work. Also, experience soon showed that some especial instrumental facilities would add greatly to the ease with which such a large mass of work as that contemplated could be performed. This was met by the construction of instruments especially for this work, which have the necessary delicacy, and provide facility for its rapid execution. They consist of a very light balance with arrangements for weighing under water, in a moist chamber, in a dry chamber, etc., by which determinations of weight as low as the tenth of a milligram, or the one-hundredth of a grain, can be made with reasonable facility. Test-tubes with suitable labels ground in the glass in which teeth partially dried could be soaked in distilled water for the removal of all air from the tubules; and steam sterilizing apparatus for the prevention of decomposition during this process. A drying oven arranged for the control of its temperature for the complete removal of free water from the teeth. A clay furnace and platinum crucible for calcining teeth for the determination of the proportions of lime-salts and organic matter; and, finally, a dynamometer for determining the strength of dentine and enamel, and of filling-materials. This instrument was also provided with a micrometer attachment for measuring the elasticity of dentine, the elasticity or compressibility of filling-materials, and which can also be used for any delicate measurements as low as one-thousandth of an inch independently of the use of the dynamometer. In order to use the dynamometer satisfactorily for the determination of the strength of the dentine, enamel, etc., it became necessary to construct machinery for cutting cubes of these materials of exact size and form; also apparatus for forming filling-materials into like form. This latter necessity was met by forming cavities in hard steel which could be filled in the ordinary manner, and then the apparatus be taken apart and the filling removed for examination. These instruments have all been built from time to time as the progress of the investigation has determined the character of the instrument needed, and not infrequently after discouraging failures occurring through an imperfect comprehension of the character and extreme delicacy of the instruments required.

## Systematization of the Work.

A still more difficult problem has been to so systematize the work as to obtain uniform conditions running through the determinations for a large number of teeth. The weights must be taken, always under like conditions, particularly of humidity and temperature of atmosphere; for they will vary with varying conditions in greater degree than the intrinsic variations in the density, or relative weights, of different teeth. Take, for instance, a tooth fresh from the mouth, wash it in distilled water, dry it in a napkin, and place it at once on scales of the required delicacy, and, in an atmosphere of ordinary humidity, it will lose weight so rapidly by the evaporation of water that it will be impracticable to balance the scales. This is true when the scales are inclosed in a glass case and the weights worked by levers from the outside. The dryer the atmosphere, the more rapid will be the loss of weight. Without control of this condition there can be no accuracy in results. This is corrected in a fair degree by converting the scale case into a moist chamber by an arrangement for packing its walls with wet blotting-paper. Again, take a tooth that has been dried, or has been allowed to dry in the open air, but is reasonably fresh, and make an attempt on different days to determine its weight, and it will be found that it will vary from one to four or five milligrams on different days. Now, if a hygrometer record is kept in connection with the weights on different days, it will be found that the differences in weight correspond with the differences in the humidity of the atmosphere. In a word, dentine, especially when reasonably fresh, has quite wonderful hygroscopic properties, absorbing water from the atmosphere in humid weather, and giving it out again in dry weather. This is appreciated by expert billiard-players, who find their ivory balls heavy and loggy in damp weather.

Changes in temperature have less effect, though they are important when considerable, necessitating care. The weights upon which the results herein given are based were all made between the temperatures of 75° and 85° F., allowing ten degrees change—rather more than should have been admitted. Changes in the barometer are found to be of too slight effect upon such light weights as have been dealt with in this work to be of importance.

These, and many other conditions calculated to vitiate the results obtained by accurate instruments, have had to be found by experiment, and have been a great drawback to rapidity of progress. When a condition that vitiated results was learned, and means devised for its control, another was discovered so continuously that much valuable material was destroyed; but, finally, results were obtained that seemed reliable.

## About the Teeth.

Here I should say a few words about the teeth before proceeding to detail the plans of work finally adopted, as it will render an understanding of the matter easier. We cannot gain anything by the determination of the specific gravity of the tooth as a whole, for the reason that it is made up of four tissues: enamel, cementum, dentine, and pulp, the relative amounts of which are different in different teeth. Some teeth have a larger relative amount of pulp than others. A first molar with its long root has a much larger proportion of dentine than a third molar with its short root and heavily enameled crown. It therefore becomes imperative that each tissue be examined separately, or that a single tissue be made the basis of the examination. I have chosen to confine the examination for density, proportion of water, lime-salts, and organic matter, to the dentine, as best expressing the character of the tooth as a whole.

Having made this choice, it next becomes necessary to choose a *specific part of the dentine, and confine the work to that particular part of each tooth.* Why a particular part? This question was answered by the determination of the density of the different parts of the dentine of a large number of teeth. This revealed the fact that the dentine of the crown of a tooth is generally heavier in proportion to its bulk, is more dense, than the dentine of the root; this difference in relative density averaging about *twenty-five thousandths of a volume.** There are, however, some inversions of this rule, for in some teeth the root is heavier, or of greater density, than the crown. This was found in about five per cent. of the teeth used for this primary examination. In the larger proportion, however, the dentine becomes less dense progressively from the occlusal portion of the crown to the end of the root.

For this reason, together with the fact that it is easier from the mechanical standpoint, I have chosen a section across the tooth at the gingival line as the portion to be examined. This section has been cut about one and a half millimeters (one-sixteenth inch) in thickness for the molars and bicuspids, and a little thicker for the cuspids and incisors. This generally includes the axial walls of the pulp-chambers. Another reason for choosing this part of the tooth, aside from the fact that it is the best representative of the average density, is that it renders available for examination a large number of deeply carious teeth that would have had to be thrown aside if a section across the occlusal portion of the crown had been chosen. Any enamel remaining on the sections has been removed. The cementum at this point is so thin that it has not been thought necessary to remove it. The particular position from which this section has been cut has been adhered to as rigidly as possible, only occasionally when a valuable tooth has presented with the crown all decayed away, the section has necessarily been taken from a position a little more toward the root. However, but few such have been used.

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*For want of a better, I shall use the word *volume* in a technical sense representing the weight of a volume of distilled water exactly equal, by measurement, to the volume of dentine. The difference in the weight of a volume of water and an equal volume of dentine is the measure of the density of the dentine. For instance, if a given volume of dentine weighs 210 milligrams and an equal volume of water weighs 100 milligrams, the dentine is one and one-tenth volumes heavier than water, and its specific gravity is 2.1. If another specimen of dentine of exactly equal volume weighs 209 milligrams, it is one-hundredth of a volume lighter than the first, or that much less dense; and its specific gravity is 2.09.

## Collection of Material.

But a small number of the teeth used in this investigation have been extracted by myself. My practice is of such a nature that I am not called upon to extract many teeth. In order to obtain material, I arranged with certain gentlemen who extract many teeth to supply me. They were instructed to place the teeth in an envelope just as they came from the mouth, write on the envelope the nativity, age, state of the general health, color of the hair, to class the teeth as bad, fair, or good, as to occurrence and rapidity of caries, record the condition of the gums, and mail the package to my address.

I have reason to believe that the classification made by these gentlemen would meet the approval of the profession. That is, that the teeth classed as bad would be generally so considered by dentists, and so with the other classifications, the general acceptation of the meaning of these terms as applied to the teeth by dentists being the guide. I have made no change in the classification that came to me in any instance. The few extractions that I have myself made have been used fresh, or without being allowed to dry for even two minutes. They went immediately from the forceps into distilled water. I have used these as a comparison with those artificially restored after some drying.

## Plans of Work.

To many, the particular method of determining the specific gravity and the percentage of water, lime-salts, and of organic matter contained in dentine may not seem so important that it should be given in detail. Yet many who are skilled in similar lines of scientific work would like to know whether these details have been carried out with sufficient rigidity. Many not familiar with such work—and most dentists are not—will have more confidence in the results if the whole matter is explained. Further, any one who may wish to make such determinations in the future will have some guide by which errors that I have fallen into may be avoided.

The determinations about to be detailed are five in number: First, the specific gravity; second, the percentage of water; third, the percentage of lime-salts; fourth, the percentage of organic matter; fifth, the strength and elasticity of the dentine. Each piece of dentine is weighed four times,—first, under water, *the submarine weight;* second, in the air wet, *the weight wet;* third, after drying, *the weight dry;* fourth, after calcining, *the weight of the lime-salts.*

The teeth coming to me as detailed under the heading "Collection of Material" are partially dried, many of them having been out of the mouth a day or two, or even one or two weeks, wrapped in paper immediately after extraction, without washing. The object now is to reproduce the normal condition as nearly as possible. The teeth are placed separately in test-tubes, marked with letters ground in the glass, and filled with distilled water, and a record made in my book of notes, of the nativity, age, color of hair, condition of health, and general condition of the teeth of the person as to caries, bad, fair, or good, and the condition of the gums, etc. This book is ruled to receive later the record of the weights and the results of the examination. Each tooth has the letter of the tube in which it is placed recorded, and each person or patient is assigned a number, as 1, 2, 3, and so on, so that on my book of notes each tooth is both numbered with the number of the patient, and has the letter of its individual tube. Besides this, the denomination of each tooth, as central incisor, upper first molar, etc., is given; the side of the mouth to which it belongs, and whether carious or perfect, is made a matter of record. This is so systematized that no tooth shall at any time lose its identity.

The teeth are allowed to stand in distilled water for twenty-four hours; not longer, for putrefaction is liable to begin. Then the tooth is cleaned and the section cut; the condition of the pulp is determined when cleaning the pulp-chamber, and it is recorded as living or dead. The section is placed again in its tube in distilled water, and a number of these are placed in a steam sterilizer and brought to the temperature of live steam and so held for ten minutes. This is to drive all air out of the dentinal tubules and to prevent decomposition; also to expel all air from the water and to put it in the best condition to absorb any air that may have remained in the tubules. These are now set aside in the water for three days, when the sterilization is repeated in the same manner, after which they are again set aside for four days more. Then, if no signs of decomposition have appeared, they are ready for the first weighing. This has been made a *condition* to which every tooth coming to me partially dried has been subjected. Rigid experiment has proven that all of this is necessary. My own extractions, as has been mentioned, have been placed immediately in distilled water with a drop of creasote to prevent decomposition, and a comparison of results obtained with partially dried teeth that have been restored has shown that this treatment is the least that is reliable for the re-impregnation of the partially dried teeth with their normal amount of water.

Now the sections of teeth are weighed under water. This I will call the *submarine weight.* In making this weight plenty of time can be taken. It requires only the usual care in taking such weights. The scale case must be packed with wet blotting-paper to render the atmosphere within sufficiently humid to prevent any drying of the slender wire by which the pan under water is suspended, in order that it may swing up and down through the water with perfect freedom; otherwise many of the results will be erroneous. Every other detail must be carried out with extreme care, for the objects are very light, from one to two hundred milligrams (six and a half to thirteen grains), and a slight error in weight gives a grave error in results.

This weight is recorded and the section returned to its tube. When all, for the time, have been weighed under water, the apparatus is changed for weighing in air, and as the sections are now to be weighed with all the water contained within the dentine, evaporation must be prevented. For this purpose the walls of the case containing the scales are again packed with wet blotting-pads, and it is kept closed, the transfers being made through small wickets and the weights worked by levers from the outside. The section is removed from the water, dried quickly in a soft napkin without rubbing, the pulp-chamber dried out with a bit of absorbent cotton, and placed immediately on the scale. It is then quickly balanced, the weight recorded, and the section returned to its tube. I say quickly, for with all care, unless the atmosphere is unusually humid, some evaporation will occur that will vitiate results. This is the second weight, or the *weight wet.*

When as many of these weights have been taken as may be convenient at the time, it is my habit to calculate the specific gravities before passing the sections to the next step, and to consider them carefully. If there appears any reason for so doing, the weights are verified by repetition before the teeth are dried. Occasionally a weight may be wrongly recorded, or some form of error has crept in which may be corrected. I have also made many repetitions, both at the same sitting and on different days, for the purpose of determining the range of error to which my instruments are liable. We speak of scientific instruments as being accurate, but this accuracy has its bounds; absolute accuracy in such work is unattainable. Every instrument has its range of error which it is important to know. My scales will work well within the tenth of a milligram. But the conditions of such work as this lead to a wider range of error than the fraction of a tenth of a milligram. There will be slight differences in drying the sections in the napkin, motes unnoticed, imperfections in balancing the scales, etc., so that the total range of error, as determined by many trials, is augmented to about three-tenths of a milligram, though I have rarely found more than two-tenths.

FIG. 1. THE SCALES.

(Reduced one and one-fourth diameters.)

The instrument is mounted on a heavy base in which there are drawers for weights, etc., and inclosed in a practically air-tight case, three sides of which are of glass. The feet (*A*) are thumb-screws for leveling the case; for perfecting which two spirit levels (*B B*) are provided. The case inclosing the scales is provided with hinges, so that it is readily thrown back when desired, uncovering the scales when changes are to be made, or the case packed with wet blotting-paper, or for other purposes. When in use it is closed, and transfers made through the small wickets (*C C*) in the ends of the case, one of which is shown partially open. The riding weights (*D*) are moved by the sliding levers (*E E*), worked from the outside, and other weights handled through the small wickets. *F* is a small lens fixed to the glass forming the front of the case, by which the exact reading of the index is facilitated. By this arrangement the scales are secured from draughts of air, kept free from dust, and the case converted into a moist chamber or dry chamber at will. The vessel (*G*) is used in weighing under water. The small perforated tray (*H*) or scale-pan is used in weighing under water.

## DRYING THE SECTIONS.

The sections are now passed to the drying-oven for the removal of the free water. They are placed separately in paper boxes; each box receiving on its lid, and on its bottom, inside, the number of the

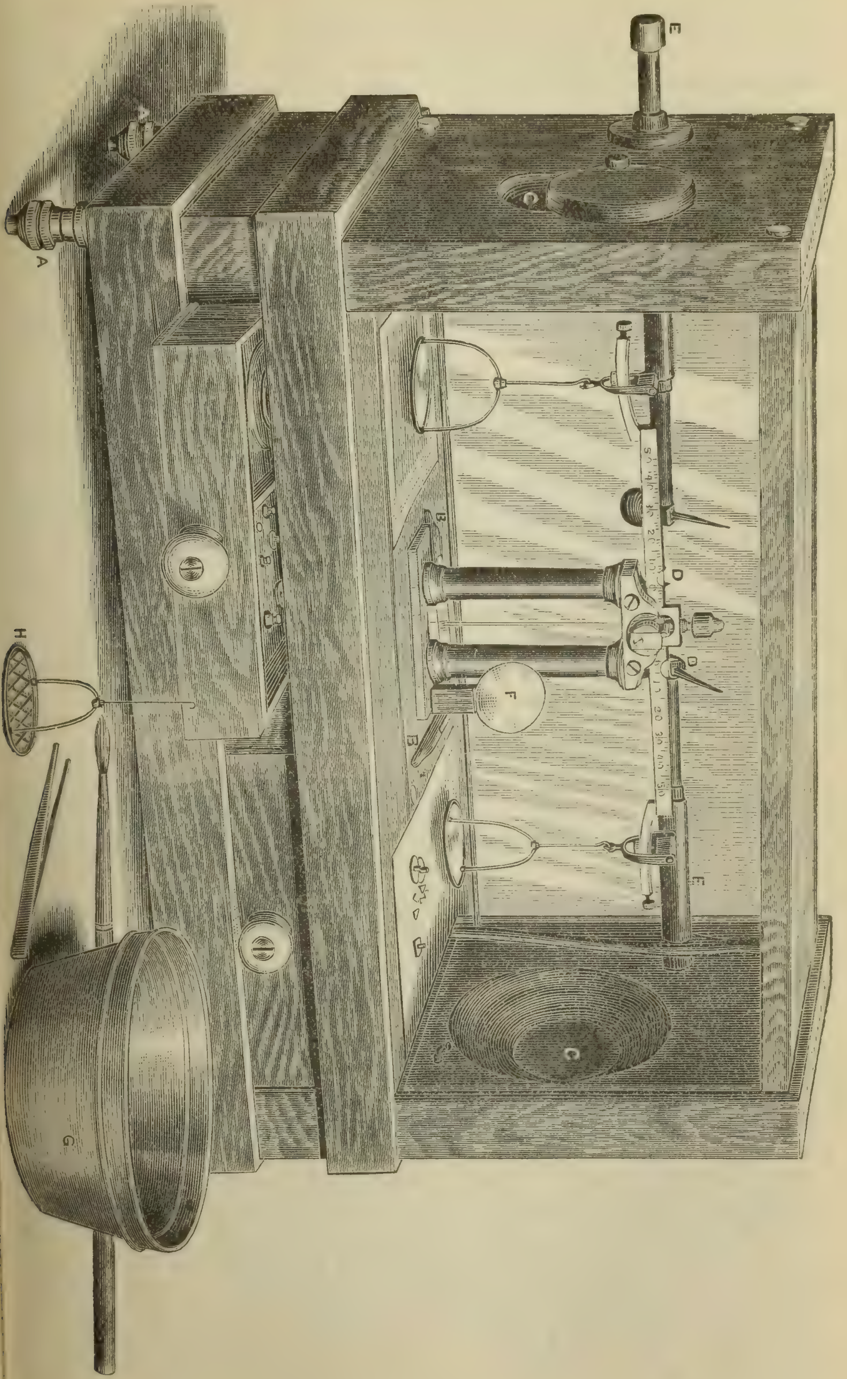

FIG. I.

patient and the letter of the tube in which the tooth was first placed. The boxes are then placed, without the lids, in a small sheet-metal oven constructed for the purpose, and lined on the bottom with asbestos, so that a very even heat may be maintained in all parts. This is heated by a coal-oil flame, which is readily adjustable, and regulated by a thermometer, which is always in place. Here they are kept twelve hours at a temperature of 200° F. It is not claimed that this drying actually removes all free water. It is made a uniform *condition* to which all of the teeth are alike subjected, and is a close approximation to the removal of all free water. The sections are then weighed to determine the amount of water lost. This I shall call the *weight dry*. This is the most difficult weight of all to make satisfactorily. As previously stated, a tooth that has been dried absorbs water from the atmosphere with great rapidity. I have found no available means of controlling this condition so that I may allow the sections to cool and obtain uniformity. This could only be possible by drying and weighing in vacuum, which I am not prepared to do. After many efforts to dry the chamber by the use of absorbents, the plan of transferring each section directly from the warm oven to the scale-pan and catching the weight as quickly as possible was adopted. After some experience, one learns that the weight is about a certain per cent. less than the weight wet, and the scales can be adjusted very nearly for each section before it is removed from the oven, so that a very few strokes of the lever on the riding-weight on the scale-arm are all that is required. The weight is read from the excursions of the needle without waiting for the balance to settle. This has given the best results that I have been able to attain.

## Calcining the Sections.

The next step is the calcining of the sections for the determination of the lime-salts and organic matter. For this purpose a small clay furnace provided with a Bunsen burner for heat, and a diminutive platinum crucible to receive the sections, was used. The apparently simple matter of burning out all organic matter requires more care than one might expect, in order to do it perfectly, and not have the sections crumble so as to endanger the accuracy of results by the loss of some particles. The reader will find a number of blanks in the tables that have occurred from this cause. If the teeth are heated rapidly, there seems to be some kind of combination of a portion of the carbon with the lime-salts so that it cannot be removed by the heat of the Bunsen burner. Therefore we cannot succeed by placing the sections directly in the white-hot crucible. After much experiment this plan was adopted : a sheet of asbestos paper was placed over the top of the furnace in such a way as not to interfere too much with the escaping flame. The section to be calcined was laid on this, and another sheet of asbestos was arched over it so as to form a kind of upper chamber into which air was freely admitted. In this position the section is heated nearly, or quite, to a dull red, the gaseous material is distilled away, carrying with it most of the carbon. Fifteen minutes in this position is sufficient, or until all signs of evaporable material have passed away, and the dentine has assumed a dull brown color. It may then be placed below, in the white-hot crucible, and allowed to remain the same length of time. It should assume an almost perfectly white color on cooling. In this way one piece can be in the upper chamber, and one in the lower continuously—often two in each—and the calcining will proceed about as rapidly as the weighing can be done and the calculations made. Taking the weights of the lime-salts presents no particular difficulty. When removed from the crucible the section may be placed on an asbestos pad and allowed to cool, and then weighed without haste. The calcined material does not absorb water rapidly. However, the weighing must not be long deferred, especially if the atmosphere is humid. Experiment has shown that at a medium state of the hygrometer calcined dentine will gain from one to one and a half per cent. in weight in twenty-four hours, and I have noted a gain of as much as two and a half per cent. in humid weather.

## USES OF THE WEIGHTS.

I have thus given in some detail the manner of taking the several weights, together with the principal difficulties attending the work. I will now try to make clear their uses. To recapitulate, they are: the weight submarine, the weight wet, the weight dry, and the weight of the lime-salts. As taken they are recorded on the blotter, which is ruled to receive them and the results derived from them, thus:

| | Description. | | | Weights in Milligrams. | | | | Results. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | The tooth. | Carious or Perfect. | The Pulp. | Submarine. | Wet. | Dry. | Lime-salts. | Specific Gravity. | Per cent. of Water. | Per cent. of Salts. | Per cent. of Organic Matter. |
| 206.— American; male, 35; tube A; hair black; health good; teeth fair; gums healthy .................. | /F. | C. | Dead. | 116.0 | 222.2 | 200.2 | 141.8 | 2.092 | 9.90 | 63.81 | 26.28 |

The case expressed in the above table will be used in explaining the uses of the weights.

After the record of the person and description of the tooth, which will be explained under the heading, "The Tables," is placed the record of each weight in its order under the heading, "Weights in Milligrams." The first two, the weight submarine and the weight wet, are used in obtaining the specific gravity, or density of the dentine. Subtract the first from the second, and the result is the weight of the water displaced by the dentine in taking the first weight; thus, $222.2 - 116.0 = 106.2$. Or, to express it differently, it is the weight of a volume of water which is exactly equal to the volume of dentine. Now we find how many times the weight of the volume of water is contained in the weight of the dentine wet. Thus, $222.2 \div 106.2 = 2.092$, which gives the specific gravity. This result is placed in the first column under "Results." This expresses the weight of the tooth as compared with a fixed standard,—*i.e.*, the weight of an equal volume of distilled water. This done, the use of the first weight is accomplished; but the weight wet, which represents the tooth in its natural condition in the mouth, is used in all subsequent calculations.

The percentage of water is obtained from the weight wet, and the weight dry. The difference between these represents the weight of water removed in the drying process. Thus, 200.2 — 222.2 = 22.0. Now add two ciphers (multiply by 100) to the weight of water and divide by the weight wet; thus, 222.2 ÷ 2200.0 = 9.90, and the result is the percentage of water, which is set in its appropriate column.

The percentage of lime-salts is obtained by adding two ciphers (multiplying by 100) to the weight of lime-salts and dividing by the weight wet. Thus, 141.800 ÷ 222.2 = 63.81. This result is also recorded in its column.

The organic matter is the weight lost in the process of burning, or the material burned out. This is virtually the remainder of the one hundred parts after finding the percentage of water and percentage of lime-salts. However, it has been calculated in every case in the following manner: The weight of lime-salts is subtracted from the weight dry, which gives the weight of organic matter lost in burning. Thus, 200.2 — 141.8 = 58.4. Two ciphers are now added to the weight of the organic matter (multiplied by 100), and divided by the weight wet. Thus, 58.400 ÷ 222.2 = 26.28. The result is the percentage of organic matter, which is recorded in its place.

If there were no remainders in the several divisions, the percentages of lime-salts, water, and organic matter would, when added together, give one hundred. But as remainders always occur, the result of the addition is always 99.99 or 99.98. This has been used constantly as a check on errors.*

It will be noticed that the weight wet has been used as the basis of each calculation. In some of the published results of the findings of lime-salts and organic matter in the teeth, the basis of the calculation has been the *weight dry*. In this case the percentages are much higher. This should be noted in making comparisons of results. In the sample case just given, the percentages of lime-salts and organic matter calculated from the weight dry would be: lime-salts, 70.82; organic matter, 29.17. The water is, of course, left out of the count. But as the water is an essential part of the tooth, it should be considered.

## THE TABLES.

The results of the work are given in tabular form. The weights, the uses of which have been explained above, are no longer of value, and have been omitted from all of the tabular presentations. Otherwise the first or the "General Table of Results" is simply a copy of the record kept during the prosecution of the work, excluding the first forty-one cases. This calls for an explanation of the numbering. In the beginning of the work it was proposed to use one hundred dried teeth without history, and number them from one to one hundred. As the work progressed it was found that the use of dried teeth was not valuable, and it was abandoned. Therefore the numbers from one to one hundred are lacking. In the early part of the work, with fresh teeth, the plans of work were changed from time to time, as the knowledge gained pointed out necessities that had not been suspected. The whole scheme had to be organized and systematized. Conditions that caused imperfect results had to be found out by experience, and means devised for their control. The first instruments had to be exchanged for better ones, and finally the second had to be exchanged for yet better ones. The teeth of forty-one persons were used in learning what instruments were necessary, in systematizing, and learning how to do the work. It was in this work that the relative density of the dentine of the different parts of the tooth was learned. The hygroscopic characters of the dentine were found out. The heat and time necessary in drying; the plans of restoring partially dried teeth; the necessity of preventing decomposition, and many other requirements for accurate work in this particular line, were developed. All of this, with its voluminous notes, has been excluded, and the results presented in brief in the preceding pages. But from that time on, nothing has been excluded or amended; but the record is presented with all of its faults and errors together with what it will give of information. It is as good as I could make it. There has been no selection whatever of teeth for this work; but such teeth as came into my hands I used, all of them that were reasonably perfect at the gingival line. They were gathered by very competent persons, mostly in Chicago and Jacksonville, only a few coming from other cities. They represent the poor, the well-to-do, and the middle classes of our people. It is worthy of note that the females largely outnumber the males. The whole is presented as a study of the physical characters of human teeth. The record is given in full, so that persons who may be so disposed may study it and develop their own conclusions, either immediately, or later, for it is my belief that another so extensive a work of this character will not soon be undertaken. Yet we can well wish that it had included a larger number of teeth as well as a greater number of persons, so that generalizations might have a broader basis.

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* In the additions for finding averages, sometimes discrepancies occur from dropping remainders, or in cases where the lime-salts of some of the teeth have been lost, so that the results added together do not always bring the numbers indicated above.

It is not expected that members of the profession generally will study the findings in detail and make tabulations and generalizations. In the nature of things such work must be done mostly by those directly interested in scientific work, and these will probably find in it important information that I shall not discover. I have, however, in the exhibits which follow the general table of results, presented tabulations from the general table, which include what seem to me at the present time the most important classifications and generalizations. These are designed for the benefit of readers who cannot take the time to make these studies from the general table of results. They will be discussed later.

## Explanation of the Tables.

On the left of the table will be found the number assigned to the person from whom the tooth, or teeth, were removed, with nativity, sex, color of hair, state of health, and the general condition of the teeth of the person as regards caries, classified as good, fair, or bad (these words referring to caries only), and the condition of the gums. In a few cases some one or more of these items are lacking. In the first ruled column the *age* is placed. Next to the right, in the ruled column is a description of each tooth. In the second the denomination of the tooth, its place, upper or lower, right or left, is given in the notation I am in the habit of using in my records. To write out all this would take much space, and it is believed that with the explanatory diagram placed at the beginning of the table it will be readily understood. In the column marked "carious or perfect," the letter "c" is placed if the tooth was carious, and the letter "p" if the tooth was perfect. No effort is made to represent the extent of caries, since we have no accepted terms in which this could be made clear. If any decay whatever, forming a cavity, was discovered, it was marked carious, but discolorations without notable loss of substance were not so marked. In the third column, marked "pulp," the letter "l" is placed if the pulp was living, and the letter "d" if the pulp was dead. The results of the examinations follow; these have been explained.

In all cases of two or more teeth from the same mouth, the reader will find the averages made ready for his reference, and for the study of personal characteristics. At the end of the table will be found the general average as made up by additions of the results for the individual teeth. The exhibits which follow are all made from the general table, leaving out the personal descriptions, but retaining the personal numbers by which easy reference to the general table of results can be made. In those exhibits in which the teeth of the individual are given by number instead of individually, the averages are made from additions of the personal averages. The exhibits will be more fully explained later.

I wish here to acknowledge to Dr. J. W. Sloanaker, of Chicago, Dr. S. B. Powel and Dr. Schermerhorn, of Jacksonville, and Dr. Fitch, of Pekin, my indebtedness for valuable aid in the collection of material for this work. Also to a number of others who have contributed a few valuable specimens. Dr. George H. Cushing, Dr. C. N. Johnson, Dr. T. L. Gilmer, and Dr. G. J. Dennis, of Chicago, visited me during the progress of the work and have, in the way of suggestions, rendered valuable assistance both in the prosecution of the work and in the preparation of the matter for publication.

### Explanatory Diagram.

The notation in which the teeth are described I will explain as follows: The upper teeth are represented by numerals from 1 to 8, and the lower teeth by letters from A to H, as placed in the following diagram:

8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8
H G F E D C B A | A B C D E F G H

It will be seen that the same figure represents the same tooth in the upper jaw, no matter which side it is on, while the same letter does the same for the lower teeth. The central perpendicular line represents the median line. These letters or figures are used singly to represent individual teeth, and a perpendicular line representing the median line is drawn beside it to show to which side it belongs. Thus: A| stands for the right lower central, |G stands for the left lower second molar, D| for the right lower first bicuspid, |8 for the left upper third molar, etc. A little familiarity with this notation makes it very easy to follow or to write.

## GENERAL TABLE OF RESULTS.

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 142. — English; female; health good; dark hair; teeth badly decayed....... | 32 | /1 | c | living | 2 085 | 10.45 | ....... | ....... |
| | | /2 | c | dead | 2.062 | 11.07 | 63.84 | 25.08 |
| | | /4 | p | l | 2.096 | 10.46 | 63.89 | 25.63 |
| | | /7 | p | l | 2.104 | 10.96 | 63.61 | 25.41 |
| | | /F | c | l | 2.113 | 10.19 | 63.99 | 25.81 |
| | | 1/ | c | l | 2.103 | 9.95 | 63.77 | 26.27 |
| | | 2/ | c | d | 2.074 | 10.56 | 63.23 | 26.20 |
| | | 4/ | p | l | 2.084 | 10.52 | 62.96 | 26.51 |
| | | 3/ | c | l | 2.099 | 10.86 | 63.82 | 25.30 |
| | | F/ | c | d | 2.104 | 10.81 | 64.48 | 24 69 |
| | | 8/ | p | l | 2.092 | 11.25 | 62.73 | 26.00 |
| | | 7/ | p | l | 2 124 | 10.60 | 65.12 | 24.27 |
| | | /3 | p | l | 2.084 | 10.92 | 62 81 | 26.25 |
| | | /G | c | l | 2.127 | 10.28 | 64.50 | 25.16 |
| | | /8 | p | l | 2.113 | 11.10 | 63.70 | 25.19 |
| | | /5 | p | l | 2 111 | 10.53 | 63.98 | 25.47 |
| Average........................... | | | | | 2.098 | 10.65 | 63.62 | 25.54 |
| Greatest difference............ | | | | | .065 | 1.30 | 1.77 | 2.00 |
| 143. — German; female; health poor; teeth badly decayed; roots of the teeth badly formed and the teeth very irregular in the arch...................... | 30 | /3 | p | l | 2.106 | 10.72 | 64.25 | 25.01 |
| | | /8 | p | l | 2.105 | 10.22 | 64.55 | 25.21 |
| | | 3/ | p | l | 2 093 | 10.44 | 63.66 | 25.88 |
| | | 8/ | p | l | 2.108 | 9.88 | 64.82 | 25 28 |
| | | 1/ | p | l | 2.092 | 10.76 | 62.97 | 26.26 |
| | | H/ | p | l | 2.104 | 10.03 | 64.18 | 25.77 |
| | | /1 | p | l | 2.079 | 11.32 | 62.02 | 26.65 |
| | | /H | p | l | 2.093 | 10.15 | 64.21 | 25.62 |
| | | 5/ | c | l | 2.085 | 10.11 | 63.54 | 26.33 |
| | | /G | c | l | 2.096 | 10.54 | 63.31 | 25.14 |
| Average .......................... | | | | | 2.096 | 10.41 | 63.75 | 25.71 |
| Greatest difference........... | | | | | .023 | 1.44 | 2.80 | 1.64 |
| 144. — American; male; black hair; good health; teeth good; pulp recently dead; used fresh........... | 25 | /8 | c | d | 2.062 | 11.81 | 61.82 | 26.36 |
| 145. — German; female; health good; teeth fair... | 45 | /3 | p | l | 2.089 | 10.22 | 63.05 | 26 71 |
| (Several teeth received from this person were too badly carious to be used.) | | /1 | p | l | 2.092 | 10.59 | 62.85 | 26.55 |
| | | 6/ | p | l | 2.088 | 10.99 | 63.06 | 25.93 |
| | | 3/ | p | l | 2.095 | 10.59 | 62.45 | 26.95 |
| Average .......................... | | | | | 2.091 | 10.59 | 62.85 | 26.15 |
| Greatest difference........... | | | | | .007 | .77 | .21 | 1.02 |
| 146. — American; female; good health; good teeth; deciduous tooth............ | 8 | 1 | c | l | 2.076 | 11.11 | 61.29 | 27.59 |
| 146½.—American; female; light hair; good health; good teeth.................. | 25 | 8 | c | l | 2.092 | 10.86 | 63.44 | 25.68 |
| 147. — American; female; dark hair; good health; teeth bad....................... | 13 | 3 | p | l | 2.043 | 12.29 | 61.08 | 26.66 |
| 148. — American; female; light hair; good health; good teeth.................... | 25 | 5 | c | l | 2.097 | 10.43 | 62.76 | 26.79 |

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 149. — American; male; light hair; good health; good teeth | 30 | 8 | c | living | 2.084 | 10.56 | 63.47 | 25.95 |
| 150.—English; male; good health; teeth badly decayed | 21 | 1/ | c | l | 2.073 | 11.73 | 62.94 | 25.32 |
| | | /2 | c | dead | 2.097 | 11.54 | 63.12 | 25.33 |
| | | 4/ | c | d | 2.078 | 11.16 | 62.58 | 26.24 |
| | | /1 | c | d | 2.067 | 12.44 | 62.05 | 25.49 |
| | | 5/ | c | d | 2.106 | 11.10 | 63.38 | 25.51 |
| | | /5 | c | l | 2.101 | 9.57 | 63.37 | 27.05 |
| Average | | | | | 2.087 | 11.26 | 62.90 | 25.82 |
| Greatest difference | | | | | .034 | 2.87 | 1.33 | 1.73 |
| 151. — American; male; health good; teeth fair | 28 | H | c | d | 2.086 | 12.23 | 64.50 | 23.26 |
| 152. — American; male; health good; teeth fair | 40 | 8 | c | l | 2.094 | 11.28 | 62.52 | 26.18 |
| 153. — American; female; health good; teeth fair | 25 | H | c | l | 2.079 | 10.45 | 63.94 | 25.60 |
| (The teeth are said to be unusually brittle.) | | 8 | c | l | 2.092 | 9.96 | 63.13 | 26.90 |
| Average | | | | | 2.085 | 10.15 | 63.53 | 26.25 |
| 154. — American; female; health fair; teeth very badly decayed | 20 | B | c | l | 2.080 | 10.39 | 63.04 | 26.56 |
| | | D | c | l | 2.068 | 11.41 | 62.75 | 25.83 |
| Average | | | | | 2.074 | 10.90 | 62.89 | 26.19 |
| 155. — American; male; health good; teeth good | 30 | D | c | d | 2.093 | 12.47 | 62.95 | 24.56 |
| 156. — American; male; health good; teeth good | 30 | F | c | d | 2.080 | 10.40 | 62.58 | 27.01 |
| 157. — American; male; health good; teeth fair | 40 | /4 | p | l | 2.079 | 10.53 | 62.93 | 26.53 |
| | | D/ | p | l | 2.095 | 10.29 | 62.44 | 27.26 |
| | | 7 | c | d | 2.094 | 10.56 | 63.12 | 26.31 |
| | | F | c | d | 2.107 | 10.97 | 63.22 | 25.79 |
| Average | | | | | 2.093 | 10.58 | 62.92 | 26.47 |
| Greatest difference | | | | | .028 | .68 | .78 | 1.47 |
| 158. — American; female; health good; teeth fair | 28 | H | c | d | 2.049 | 11.42 | 63.67 | 24.90 |
| 159. — American; male; health good; teeth fair | 38 | 4 | c | d | 2.074 | 11.55 | 62.43 | 26.01 |
| 160. — American; female; health good; teeth good | 30 | C | p | l | 2.083 | 10.85 | 62.50 | 26.64 |
| (Deformed tooth.) | | 7 | c | d | 2.061 | 10.75 | ...... | ...... |
| Average | | | | | 2.072 | 10.80 | | |
| 161. — American; male; health good; teeth good; calcic inflammation of gums | 38 | B | p | l | 2.089 | 10.00 | 63.57 | 26.42 |

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 162.—American; female; health good; teeth good; arsenic application three months ago; pulp chamber open | 20 | 6 | c | dead | 2.098 | 11.40 | 63.83 | 24.75 |
| 163.—American; female; health good; teeth good; pulp chamber open for three years | 30 | 4 | c | d | 2.097 | 11.47 | 63.47 | 25.04 |
| 164.—American; female; health good; teeth good | 35 | H | c | d | 2.070 | 12.02 | 62.73 | 25.23 |
| 165.—Irish; female; dark hair; health good; teeth good | 22 | H | p | living | 2.106 | 10.97 | 64.53 | 24.48 |
| 166.—American; female; light brown hair; health good; teeth good; teeth removed for correction of irregularity | 13 | 4/ | p | l | 2.078 | 10.72 | 62.22 | 26.96 |
| | | /4 | p | l | 2.071 | 11.01 | 62.57 | 26.41 |
| Average | | | | | 2.074 | 10.86 | 62.39 | 26.68 |
| 167.—American; female; deciduous tooth that had persisted in place | 30 | 5 | c | l | 2.101 | 10.48 | 63.19 | 26.32 |
| 168.—American; female; health good; teeth good; phagedenic pericementitis | 40 | G | c | l | 2.085 | 11.28 | 64.51 | 24.12 |
| 169.—American; female; health good; teeth good; phagedenic pericementitis | 40 | 1/ | p | l | 2.109 | 10.95 | 64.00 | 25.04 |
| | | /1 | p | l | 2.081 | 11.50 | 63.34 | 25.15 |
| | | 2/ | p | l | 2.100 | 10.65 | 63.58 | 25.76 |
| | | 3/ | c | l | 2.104 | 10.94 | 64.04 | 25.00 |
| | | /2 | p | l | 2.099 | 11.22 | 63.42 | 25.35 |
| | | /3 | p | l | 2.127 | 10.15 | 64.47 | 25.37 |
| Average | | | | | 2.103 | 10.90 | 63.80 | 25.27 |
| Greatest difference | | | | | .046 | 1.07 | 1.03 | .37 |
| 170.—American; male; black hair; health good; teeth good | 50 | C | c | l | 2.088 | 11.61 | 63.27 | 25.11 |
| 171.—American; female; black hair; health good; teeth good | 20 | F | c | d | 2.098 | 11.72 | 63.70 | 24.56 |
| 172.—American; male; black hair; health good; teeth fair; gums healthy | 63 | 8 | c | l | 2.124 | 10.62 | 64.42 | 24.95 |
| 173.—German Hebrew; female; brown hair; health poor; teeth badly decayed | 25 | 1/ | p | l | 2.095 | 11.11 | 63.32 | 25.56 |
| (This person seemed to be a confirmed invalid from some female trouble.) | | 2/ | c | l | 2.092 | 10.27 | 63.98 | 25.73 |
| | | /1 | p | l | 2.099 | 10.65 | 63.65 | 25.68 |
| | | /6 | p | l | 2.095 | 10.98 | ....... | ....... |
| | | 3/ | p | l | 2.081 | 11.24 | 63.67 | 25.08 |
| | | 6/ | c | d | 2.085 | 11.67 | 64.18 | 24.15 |
| | | /3 | p | l | 2.102 | 10.77 | 64.26 | 24.95 |
| | | /7 | c | l | 2.110 | 10.73 | ....... | ....... |
| | | /8 | c | l | 2.131 | 10.52 | ....... | ....... |
| | | /G | c | l | 2.095 | 10.73 | ....... | ....... |
| | | 8/ | p | l | 2.098 | 11.27 | 63.60 | 25.26 |
| Average | | | | | 2.098 | 10.90 | 63.80 | 25.20 |
| Greatest difference | | | | | .050 | 1.40 | .94 | 1.58 |

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 174.—American; male; light hair; health good; teeth badly decayed; gums healthy; teeth badly worn by mastication and the pulps much calcified | 51 | 3/ | c | living | 2.122 | 9.71 | 64.55 | 25.38 |
| | | 2/ | c | l | 2.107 | 10.05 | 64.41 | 25.53 |
| | | /3 | c | l | 2.101 | 10.37 | 64.47 | 25.14 |
| | | /2 | c | l | 2.101 | 10.76 | 64.02 | 25.21 |
| | | 4/ | c | l | 2.123 | 9.81 | 65.47 | 24.66 |
| | | 8/ | p | l | 2.123 | 10.34 | ……. | ……. |
| | | 5/ | c | l | 2.114 | 9.98 | 64.97 | 25.04 |
| Average | | | | | 2.113 | 10.14 | 64.64 | 25.16 |
| Greatest difference | | | | | .022 | 1.05 | 1.45 | 0.87 |
| 175.—American; female; black hair; health good; teeth decaying badly | 45 | /3 | c | dead | 2.078 | 11.84 | ……. | ……. |
| | | /8 | c | d | 2.099 | 11.29 | ……. | ……. |
| | | 8/ | p | l | 2.085 | 10.84 | ……. | ……. |
| | | D/ | c | l | 2.089 | 10.05 | 64.33 | 25.60 |
| | | E/ | c | l | 2.096 | 10.58 | 63.31 | 26.10 |
| Average | | | | | 2.089 | 10.92 | 63.82 | 25.85 |
| Greatest difference | | | | | .021 | 1.79 | 1.02 | .50 |
| 176.—American; female; dark brown hair; health good; teeth badly decayed; gums healthy | 20 | /1 | c | l | 2.087 | 11.09 | ……. | ……. |
| | | /2 | c | l | 2.106 | 10.45 | 65.75 | 23.79 |
| | | 1/ | c | l | 2.090 | 11.13 | 63.90 | 24.96 |
| | | 4/ | p | l | 2.088 | 10.99 | 63.74 | 25.25 |
| Average | | | | | 2.092 | 10.91 | 64.49 | 24.66 |
| Greatest difference | | | | | .019 | .68 | 2.01 | 1.46 |
| 177.—Negress; health good; teeth excellent; no caries whatever; teeth knocked out by a blow; were used without any drying | 35 | 1/ | p | l | 2.088 | 11.09 | 62.47 | 26.15 |
| | | 2/ | p | l | 2.102 | 11.16 | 63.15 | 25.68 |
| Average | | | | | 2.095 | 11.12 | 62.81 | 25.91 |
| Greatest difference | | | | | .014 | .07 | .68 | .47 |
| 178.—American; female; light hair; health good; teeth good; gums healthy; removed for irregularity | 18 | 4/ | p | l | 2.081 | 10.10 | 62.66 | 27.23 |
| | | /4 | p | l | 2.078 | 11.11 | 62.87 | 26.01 |
| Average | | | | | 2.079 | 10.60 | 62.76 | 26.62 |
| 179.—French; male; brown hair; health good; teeth good; gums healthy | 23 | 4/ | c | l | 2.093 | 10.61 | 63.78 | 25.60 |
| 180.—American; male; dark brown hair; health good; teeth good; gums healthy | 35 | /8 | p | l | 2.107 | 10.48 | 64.00 | 25.51 |

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter |
|---|---|---|---|---|---|---|---|---|
| 181.—American; female; light hair; health good; teeth good; gums healthy | 22 | 8/ | p | dead | 2.081 | 12.01 | 63.18 | 24.80 |
| 182.—American; female; dark hair; health good; teeth good; gums healthy | 23 | /A | p | d | 2.055 | 12.24 | ....... | ....... |
| 183.—American; female; light hair; health good; teeth good; gums healthy | 25 | /H | p | living | 2.105 | 10.94 | 63.00 | 26.05 |
| 184.—American; male; dark hair; health good; teeth bad; gums diseased (calculus) | 55 | /B | p | l | 2.112 | 10.94 | 64.42 | 24.63 |
| | | /C | c | d | 2.128 | 10.25 | 64.50 | 25.23 |
| Average | | | | | 2.120 | 10.59 | 64.46 | 24.93 |
| 185.—American; female; brown hair; health good; teeth bad; gums healthy | 20 | 6/ | c | d | 2.074 | 11.54 | 63.43 | 25.02 |
| 186.—American; female; light hair; health good; teeth bad; gums healthy | 20 | /D | c | d | 2.068 | 11.19 | 62 77 | 26.02 |
| 187.—Irish; female; black hair; health good; teeth bad; gums healthy | 35 | 3/ | c | d | 2.080 | 11.27 | 63.34 | 25.37 |
| | | /3 | c | l | 2.070 | 10.79 | 62.56 | 26.64 |
| | | 4/ | c | l | 2.087 | 10.30 | 62.61 | 27.07 |
| Average | | | | | 2.079 | 10.78 | 62.83 | 26.36 |
| Greatest difference | | | | | .017 | .97 | .78 | 1.70 |
| 188.—American; male; light hair; health good; teeth decaying badly; gums healthy | 16 | F/ | c | l | 2.067 | 12.67 | 61.71 | 25.61 |
| 189.—American; female; black hair; health good, teeth fair; gums healthy | 24 | /1 | c | l | 2.078 | 10.97 | 63.51 | 25.50 |
| | | /4 | p | l | 2.098 | 10.35 | 63.64 | 26.00 |
| | | /2 | c | l | 2.108 | 11.14 | 63.85 | 25.00 |
| | | /3 | p | l | 2.097 | 10.94 | 63.91 | 25.13 |
| | | 2/ | c | l | 2.088 | 11.52 | 63.58 | 24.88 |
| | | 3/ | p | l | 2.110 | 10.75 | 63.36 | 25 68 |
| | | 4/ | p | l | 2.117 | 10.74 | 63.76 | 25.49 |
| Pulp dead in chamber, but not decomposed in the root-canals | | 7/ | c | l | 2 125 | 11.01 | 64.53 | 24.45 |
| | | 5/ | p | l | 2.114 | 11.25 | 63.54 | 25.21 |
| Crowns deformed | | 8/ | p | l | 2.105 | 12.04 | 63.67 | 24.27 |
| | | /8 | p | l | 2.121 | 10.53 | ... ... | ....... |
| Average | | | | | 2.105 | 10.99 | 63.63 | 25.51 |
| Greatest difference | | | | | .047 | 1.69 | 1.17 | 1.73 |

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 190.—English; female; dark hair; health good; teeth good; very little caries and no teeth lost from caries; gums diseased, causing the teeth to loosen...................... | 38 | /1 | p | living | 2.075 | 11.89 | 63.83 | 24.22 |
| | | /8 | p | l | 2.086 | 11.71 | 64.04 | 24.24 |
| | | 3/ | c | l | 2.079 | 12.07 | 63.46 | 24.45 |
| | | 8/ | p | l | 2.099 | 11.65 | 63.97 | 24.37 |
| | | /3 | c | l | 2.071 | 11.85 | 62.59 | 25.54 |
| | | /7 | p | l | 2.089 | 11.28 | 63.50 | 25.21 |
| | | 7/ | c | l | 2.074 | 12.30 | 63.26 | 24 43 |
| Average.......................... | | | | | 2.082 | 11.76 | 63.52 | 24.64 |
| Greatest difference........... | | | | | .028 | 1.02 | 1.45 | 1.32 |
| 191.—American; female; light hair; health always good; teeth very badly decayed; roots of the teeth unusually slender..<br>NOTE.—In this case nothing was left of the lower bicuspids but some pieces of roots, but the lower anterior teeth were not badly decayed. Most of those marked carious in the upper jaw had lost nearly the whole crown.. | 25 | 1/ | c | d | 2.105 | 10.59 | 64.19 | 25.20 |
| | | 2/ | c | l | 2.096 | 10.96 | 63.98 | 25.05 |
| | | /1 | c | l | 2.083 | 10.94 | 63.88 | 25.15 |
| | | /2 | c | l | 2.090 | 10.48 | 64.21 | 25.24 |
| | | 3/ | p | l | 2.108 | 11.22 | 63.54 | 25.22 |
| | | 4/ | c | l | 2.101 | 11.34 | 64.29 | 24.25 |
| | | 8/ | c | l | 2.133* | 11.25 | 65.03 | 23.71 |
| | | /3 | c | l | 2.109 | 11.20 | 64.78 | 24.01 |
| | | 6/ | c | l | 2.110 | 11.07 | 64.77 | 24.14 |
| | | 5/ | p | l | 2.089 | 11.10 | 64.61 | 24.27 |
| | | /6 | p | l | 2.099 | 11.52 | 64.58 | 23.89 |
| | | /5 | p | l | 2.107 | 11.19 | 64.79 | 24.01 |
| | | /8 | c | l | 2.117 | 10.90 | 65.00 | 24.09 |
| | | 7/ | c | l | 2.106 | 10.67 | 64.70 | 24.62 |
| Average.......................... | | | | | 2.104 | 11.03 | 64.45 | 24.49 |
| Greatest difference...... ..... | | | | | .050 | 1.04 | 1.49 | 1.53 |
| 192.—American; male; sandy hair; health very poor; chronic invalid; teeth fair as to caries, the cavities being small; calcic inflammation of peridental membranes. These teeth were used perfectly fresh; not allowed to dry at all...... | 44 | 1/ | c | l | 2.087 | 12 25 | 62.04 | 25.69 |
| | | 2/ | c | l | 2.066 | 11.08 | 63.74 | 25.17 |
| | | 3/ | p | l | 2.106 | 11.31 | 63.80 | 24.88 |
| | | /3 | c | l | 2.080 | 11 94 | 63.56 | 24.44 |
| | | 4/ | p | l | 2.096 | 11.33 | 63.97 | 24.68 |
| | | /4 | c | l | 2.108 | 10.81 | 63.74 | 25.44 |
| | | 6/ | c | l | 2.098 | 11.29 | 64.57 | 24.12 |
| | | /6 | c | l | 2.068 | 13.49 | 62.05 | 24.45 |
| | | 7/ | p | l | 2.111 | 10.77 | 64.51 | 24.71 |
| | | /7 | p | l | 2.098 | 11.19 | 64.26 | 24.53 |
| Average....................... ..... | | | | | 2.092 | 11.54 | 63.64 | 24.81 |
| Greatest difference............ | | | | | .045 | 2.72 | 2.53 | 1.57 |
| 193.—American; male; health good; teeth good but badly worn; no caries; calcic inflammation of membranes... | 50 | 6/ | p | l | 2.109 | 10.46 | 64.66 | 24.86 |

* Carefully verified. Crown half decayed away.

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter |
|---|---|---|---|---|---|---|---|---|
| 194.—Portuguese; female; dark hair; health good; teeth good; gums healthy........................ | 31 | /F | c | dead | 2.101 | 10.14 | 63.71 | 26.14 |
| 195.—American; male; black hair; health good; teeth good; calcic inflammation and loosening of the teeth.............. | 61 | 3/ | p | living | 2.118 | 9.58 | 63.07 | 27.33 |
| | | 8/ | p | l | 2.112 | 9.62 | 64.16 | 26.21 |
| | | /8 | c | d | 2.113 | 9.72 | 64.66 | 25.60 |
| Average ........................ | | | | | 2.114 | 9.64 | 63 96 | 26.38 |
| Greatest difference........... | | | | | .006 | .14 | 1.59 | 1.73 |
| 196.—Irish; male; brown hair; health good; teeth good; gums healthy... .. | 35 | 6/ | c | l | 2.096 | 10.20 | 64.11 | 25.66 |
| 197.—American; female; light hair; health good; teeth good; gums healthy...................... ..... | 40 | A/ | c | d | 2.087 | 10.00 | 63.98 | 26.04 |
| | | B/ | c | l | 2.105 | 10.04 | 64.04 | 25.91 |
| Average........................... | | | | | 2.096 | 10.02 | 64.01 | 25.87 |
| 198.—American; female; gray hair; health good; teeth fair; gums healthy; large exostosis of root... | 35 | 8/ | p | l | 2.123 | 10.07 | 64.77 | 25.15 |
| 199.—English; female; black hair; health good; teeth good; gums healthy......................... .. | 19 | /B | p | l | 2.082 | 11.22 | 63.26 | 25.50 |
| 200.—American; male; brown hair; health good; teeth good; gums healthy.......................... | 27 | H/ | p | I | 2.098 | 11.54 | 64.77 | 23.67 |
| 201.—American; male; light hair; health good; teeth good; gums healthy......................... | 18 | D/ | c | d | 2.102 | 10.42 | 64.20 | 25.37 |
| 202.—American; male; light hair; health good; teeth good; calcic inflammation; teeth badly worn............... ......... | 40 | /F | p | l | 2.072 | 11.83 | 63.99 | 24.17 |
| 203.—German; male; light hair; health good; teeth good........................ | 35 | 8/ | c | d | 2.082 | 11.61 | 63.31 | 25.06 |
| 204.—American; male; light hair; health good; teeth good; gums healthy.......................... | 20 | 8/ | c | I | 2.042 | 11.56 | 62.01 | 26.41 |
| 205.—American; male; light hair; health good; teeth good; gums healthy .... .................. | 28 | /8 | c | l | 2.070 | 11.61 | 63.19 | 25.18 |
| | | 8/ | c | d | 2.043 | 12.80 | 62.01 | 25.17 |
| Average..... ...................... | | | | | 2.056 | 12.23 | 62.60 | 25.67 |

### GENERAL TABLE OF RESULTS.—*Continued.*

|  | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 206.—American; male; black hair; health good; teeth fair; gums healthy. | 35 | /F | c | dead | 2.092 | 9.90 | 63.81 | 26.28 |
| 207.—American; male; light hair; health good; teeth fair; gums healthy. | 12 | /F | c | living | 2.073 | 10.62 | 62.40 | 26.97 |
| 208.—American; male; subject of severe accident two years ago, resulting in exsection of knee-joint; very poorly nourished; teeth decaying rapidly; teeth of family very bad............ | 18 | F/ | c | l | 2.080 | 10.85 | 63.65 | 25.48 |
| 209.—American; male; light hair; health good; teeth good; phagedenic pericementitis............... | 58 | 7/ | p | d | 2.100 | 11.47 | 63.61 | 24.91 |
| 210.—American; female; light hair; health good; good teeth.................... | 22 | H/ | c | l | 2.054 | 12.95 | ....... | ....... |
| 211.—American; female; dark hair; a frail child; blind; teeth decaying very badly; gums healthy......................... | 11 | /F | c | d | 2.061 | 12.87 | ....... | ....... |
| 212.—American; male; dark hair; health good; teeth badly decayed; all of the first molars deeply decayed........................ | 10 | F/ | c | l | 2.064 | 12.60 | 61.77 | 25.62 |
| 213.—American; male; dark hair; health good; teeth excellent, only one carious....................... | 25 | F/ | c | l | 2.080 | 11.69 | 63.01 | 25.28 |
| 214.—American; male; light hair; health good; teeth good; gums healthy; most of the teeth are worn badly, but this one has escaped wear..... | 60 | /F | c | d | 2.106 | 11.00 | 64.68 | 24.30 |
| 215½.—American; male; light hair; health good; teeth bad; all of the first molars deeply decayed; incisors also carious*..... | 9 | /F | c | l | 2.092 | 11.83 | 63.81 | 24.30 |
| 215.—American; male; health good; teeth good; gums healthy...... ......... | 31 | E | c | l | 2.126 | 10.07 | ....... | ....... |
|  |  | F | c | d | 2.117 | 10.23 | ....... | ....... |
| Average.................. ......... |  |  |  |  | 2.121 | 10.15 | ....... | ....... |
| 216.—American; male; dark hair; health good; teeth badly carious; gums healthy................. | 26 | /5 | c | l | 2.098 | 9.98 | 63.18 | 26.92 |
|  |  | /6 | c | l | 2.099 | 11.03 | 63.31 | 25.64 |
|  |  | 7/ | c | l | 2.107 | 10.52 | 63.52 | 25.94 |
| Average.................... ....... |  |  |  |  | 2.101 | 10.51 | 63.33 | 26.16 |
| Greatest difference.......... |  |  |  |  | .009 | 1.05 | .34 | 1.28 |

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* Nos. 206 to 215½ inclusive were thrown, immediately they were extracted, into distilled water to which creasote had been added to prevent putrefaction. They were prepared, and kept in this bath until weighed, not having been heated at any time. They were intended as a comparison with partially dried teeth treated by sterilization by heat.

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 217.—American; female; health good; teeth badly decayed; gums healthy; teeth small, with unusually short roots......... | 36 | /3 | c | dead | 2.105 | 9.57 | 63.89 | 26.72 |
| | | 3/ | c | living | 2.111 | 10.47 | 63.35 | 26.16 |
| | | /1 | c | l | 2.095 | 10.55 | 63.43 | 26.01 |
| | | /4 | c | l | 2.114 | 9.32 | 64.05 | 26.62 |
| | | 4/ | c | l | 2.090 | 10.59 | 63.26 | 26.21 |
| | | 7/ | c | l | 2.108 | 10.22 | 63.77 | 26.00 |
| | | 1/ | c | l | 2.108 | 10.26 | 63.28 | 26.44 |
| Average.......................... | | | | | 2.104 | 10.14 | 63.57 | 26.30 |
| Greatest difference............ | | | | | .024 | 1.15 | .79 | .72 |
| 218.—Irish; male; brown hair; health good; teeth good; gums healthy...... | 16 | 6/ | c | d | 2.078 | 11.99 | 62.83 | 25.15 |
| 219.—American; male; very gray; health good; teeth good; gums good; teeth badly worn...... ..... | 72 | *F/ | c | d | 2.053 | 12.15 | 62.85 | 24.99 |
| | | /3 | c | l | 2.110 | 11.05 | 64.37 | 24.56 |
| | | †1/ | p | l | 2.099 | 11.79 | 63.05 | 25.15 |
| Average............ .......... ..... | | | | | 2.087 | 11.66 | 63.42 | 24.90 |
| Greatest difference............ | | | | | .057 | 1.10 | 1.52 | .59 |
| 220.—American; male; fair hair; health good; teeth badly carious, and irregularities in the arch; alveolar abscess recent, as pulp-tissue was but partially decomposed..... | 16 | F | c | d | 2.078 | 12.29 | 63.45 | 24.24 |
| 221.—American; male; light hair; health good; teeth good; gums good. | 23 | F | c | l | 2.100 | 10.91 | 64.39 | 24.68 |
| 222.—French; male; dark hair; health good; teeth badly carious; gums healthy; back teeth all carious; front teeth good. | 22 | /4 | c | l | 2.098 | 11.05 | 63.80 | 25.12 |
| | | /5 | c | l | 2.087 | 11.53 | 63.46 | 25.00 |
| | | 4/ | c | l | 2.075 | 12.14 | 62.48 | 25.37 |
| | | 6/ | c | l | 2.090 | 11.92 | 63.57 | 24.50 |
| | | /C | c | d | 2.062 | 11.98 | 62.93 | 25.07 |
| Average.................. ......... | | | | | 2.082 | 11.72 | 63.24 | 25.01 |
| Greatest difference............ | | | | | .036 | 1.09 | 1.09 | .87 |
| 223.—American; female; brown hair; health good; teeth bad; gums healthy. | 23 | 1/ | c | l | 2.058 | 11.87 | 63.10 | 25.01 |
| | | 2/ | c | d | 2.074 | 11.53 | 61.63 | 26.83 |
| | | 6/ | c | l | 2.085 | 11.41 | 63.32 | 25.26 |
| | | /6 | c | d | 2.067 | 11.80 | 63.27 | 24.91 |
| | | /4 | c | l | 2.079 | 11.70 | 62.72 | 25.57 |
| | | /2 | p | l | 2.057 | 11.66 | 62.91 | 25.42 |
| Average............ ............... | | | | | 2.070 | 11.66 | 62.82 | 25.50 |
| Greatest difference............ | | | | | .028 | .34 | 1.69 | .66 |

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* This tooth is badly carious and black through root and crown.

† So worn that the occlusal face became the face of the section.

### GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 224.—American; male; light hair; health good; teeth good; phagedenic pericementitis.................. | 61 | 7/ | p | living | 2.099 | 10.82 | 64.25 | 24.91 |
| 225.—American; male; light hair; health good; teeth good; diseased gums .............................. | 51 | 2/ | c | dead | 2.121 | 10.61 | 62.08 | 27.30 |
| 226.—American; male; dark hair; health good; teeth good; gums diseased; pulp-chamber of the tooth contained an unusually large calcific mass that was very transparent.......................... | 63 | /6 | c | l | 2.104 | 10.27 | 68.24 | 21.48 |
| 227.—American; female; light hair; health good; teeth good; gums healthy........................... | 49 | G/ | c | l | 2.105 | 11.12 | 64.53 | 24.33 |
| 228.—American; female; light hair; health good; teeth good; gums healthy..... ................... | 42 | /H | c | l | 2.101 | ..... . | ....... | ..... . |
| | | /E | c | d | 2.108 | 9.98 | 64.06 | 25.95 |
| Average. ... ...................... | | | | | 2.104 | ..... . | ..... . | ....... |
| 228½.—American; female; light hair; health good; teeth fair; gums healthy. | 24 | /H | c | l | 2.068 | 11.52 | ..... . | ....... |
| 229.—American; male; black hair; health good; teeth bad; gums healthy. | 22 | /5 | c | l | 2.105 | 11.40 | ..... . | ..... . |
| 230.—American; male; dark hair; health good; teeth good; gums healthy..... ................... | 35 | /4 | c | l | 2.101 | 11.02 | 63.54 | 25.43 |
| | | */5 | p | l | 2.102 | 11.52 | 63.39 | 25.08 |
| | | †/1 | p | l | 2.068 | 11.08 | 63.33 | 25.57 |
| | | ‡3/ | p | l | 2.074 | 12.15 | 63.27 | 24.56 |
| | | §/7 | p | l | 2.097 | 11.35 | 64.63 | 24.01 |
| | | 7/ | p | l | 2.087 | 11.53 | 63.94 | 24.52 |
| Average.................... ...... | | | | | 2.088 | 11.44 | 63.68 | 24.86 |
| Greatest difference............ | | | | | .034 | 1.13 | 1.36 | 1.56 |
| 231.—Negro; male; health good; teeth fair; gums healthy........................... | 47 | F/ | c | d | 2.103 | 10.92 | 64.13 | 24.94 |
| 232.—American; female; health good; teeth good; gums healthy................. | 65 | /8 | c | l | 2.119 | 10.45 | 64.10 | 25.44 |

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* Slightly worn.

† Crown two-thirds worn. This tooth was worn in such a way that the face of the worn portion was the face of the section. It is another evidence that the worn dentine becomes soft, especially after nutrition is shut off from the worn portion by calcification of the pulp.

‡ Crown half worn.

§ Not worn. See crushing stresses.

GENERAL TABLE OF RESULTS.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 233.—American; female; dark brown hair; health poor; teeth good; teeth lost by disease of the peridental membranes; there was no caries whatever in any of the teeth.......... | 60 | */1 | p | dead | 2.110 | 11.37 | 62.83 | 25.79 |
| | | 1/ | p | living | 2.075 | 11.92 | 63.43 | 24.63 |
| | | 2/ | p | l | 2.108 | 10.76 | 63.73 | 25.48 |
| | | /2 | p | l | 2.098 | 12.05 | 63.36 | 24.57 |
| | | /3 | p | l | 2.091 | 11.76 | 63.78 | 24.45 |
| | | 3/ | p | l | 2.095 | 11.30 | 63.84 | 24.84 |
| | | /4 | p | l | 2.088 | 11.56 | 62.95 | 25.84 |
| | | 4/ | p | l | 2.086 | 11.31 | 63.22 | 25.46 |
| | | †5/ | p | l | 2.059 | 12.16 | 62.25 | 25.57 |
| | | 6/ | p | l | 2.086 | 12.19 | 63.52 | 24.27 |
| | | /6 | p | d | 2.093 | 11.74 | 63.62 | 24.63 |
| | | /7 | p | l | 2.109 | 11.16 | 63.94 | 24.89 |
| | | 7/ | p | l | 2.097 | 11.24 | 63.59 | 25.15 |
| | | D/ | p | l | 2.111 | 11.08 | 63.97 | 24.94 |
| Average........................ | | | | | 2.093 | 11.54 | 63.35 | 25.10 |
| Greatest difference............ | | | | | .052 | 1.43 | 1.72 | 1.57 |
| 234.—American; male; light hair; health poor; teeth good; lost by disease of gums.................. | 60 | 6/ | p | l | 2.122 | 10.02 | 64.57 | 25.40 |
| 235.—American; female; health good; teeth all lost by caries; gums healthy........................ | 55 | /5 | c | d | 2.091 | 10.42 | 63.19 | 26.38 |
| 236.—American; male; light hair; health good; teeth bad; all of the first molars decayed............ | 10 | /F | c | d | 2.072 | 11.30 | 62.85 | 25.83 |
| 237.—Scotch; female; light hair; health good; teeth bad; gums healthy........ | 31 | G/ | c | l | 2.100 | 10.50 | 64.11 | 25.37 |
| 238.—American; female; light hair; health good; teeth bad; lost all but five from caries..................... | 55 | 1/ | c | l | 2.098 | 11.37 | 63.87 | 24.74 |
| | | 2/ | c | l | 2.102 | 11.45 | 63.47 | 25.06 |
| | | /5 | c | l | 2.099 | 11.05 | 63.35 | 25.59 |
| Average........................... | | | | | 2.099 | 11.29 | 63.56 | 25.13 |
| Greatest difference .......... | | | | | .004 | .40 | .52 | .85 |
| 239.—American; male; dark hair; health good; teeth bad; all of the upper teeth lost from caries........................ | 30 | 4/ | c | l | 2.080 | 11.74 | 63.01 | 25.24 |
| 240.—American; female; light hair; health good; teeth good.................... | 30 | 6/ | c | l | 2.106 | 11.06 | 64.17 | 24.76 |
| 241.—Negress; health good; excellent teeth; gums healthy; teeth lost by a blow................ | 20 | 6/ | p | l | 2.072 | 12.01 | 63.36 | 24.61 |

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* This tooth had the pulp-chamber and the root-canal filled with oxyphosphate of zinc. History unknown.

† Carefully verified. It is remarkable for its low specific gravity.

General Table of Results.—*Continued.*

| | Age. | Tooth. | Carious or Perfect. | Pulp. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| 242.—American; male; health good; teeth good; gums diseased | 54 | /6 | p | living | 2.117 | 10.69 | 64.58 | 24.73 |
| 243.—American; female; light hair; health good; teeth good; gums healthy | 14 | F/ | c | l | 2.036 | 13.59 | 61.81 | 24.59 |
| 244.—American; female; light hair; health good; teeth good; gums healthy | 16 | /F | c | dead | 2.080 | 11.68 | 63.59 | 24.72 |
| 245.—American; female; light hair; health good; teeth good; gums healthy | 12 | /F | c | l | 2.068 | 11.77 | 62.42 | 25.80 |
| 246.—American; female; light hair; health good; teeth good; gums healthy; roots of teeth not fully formed; no other carious teeth | 9 | F/ | c | d | 2.072 | 11.87 | 62.76 | 25.35 |
| | | /F | c | l | 2.069 | 12.17 | 62.83 | 24.99 |
| Average | | | | | 2.070 | 12.02 | 62.79 | 25.17 |
| 247.—American; female; dark hair; health good; teeth good; gums healthy | 27 | 6/ | c | l | 2.104 | 11.25 | 64.79 | 23.95 |
| 248.—American; female; dark hair; health good; teeth bad; gums healthy | 25 | 1/ | c | l | 2.067 | 12.59 | 61.98 | 25.42 |
| | | 3/ | c | l | 2.094 | 11.65 | 62.49 | 25.85 |
| Average | | | | | 2.080 | 12.12 | 62.23 | 25.63 |
| 249.—American; male; light hair; health good; teeth nearly all lost by senile caries; bad; gums healthy | 71 | /F | c | l | 2.131 | 10.00 | 64.67 | 25.32 |
| 250.—American; male; dark hair; health good; teeth fair; gums healthy | 51 | /6 | c | l | 2.103 | 11.22 | 64.29 | 24.48 |
| Average age | 32.33 | | | | | | | |
| General average* | | | | | 2.092 | 11.06 | 63.54 | 25.36 |
| Number of teeth | | 268 | | | | | | |
| Number of persons | 111 | | | | | | | |
| Average for six specimens of ivory | | | | | 1.752 | 21.59 | 47.06 | 31.34 |

* The general average is made from footings of individual teeth.

| EXHIBIT OF TEETH OF PERSONS LESS THAN FIFTEEN YEARS OLD. | Case. | Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| Deciduous tooth................ | 146 | 8 | 1 | 2.076 | 11.11 | 61.29 | 27.59 |
| | 147 | 13 | 1 | 2.043 | 12.29 | 61.08 | 26.66 |
| | 166 | 13 | 2 | 2.074 | 10.86 | 62.39 | 26.68 |
| | 207 | 12 | 1 | 2.073 | 10.62 | 62.40 | 26.97 |
| | 211 | 11 | *1-0 | 2.061 | 12.87 | ...... | ...... |
| | 212 | 10 | 1 | 2.064 | 12.60 | 61.77 | 25.62 |
| | 215½ | 9 | 1 | 2.092 | 11.83 | 63.81 | 24.30 |
| | 236 | 10 | 1 | 2.072 | 11.30 | 62.85 | 25.83 |
| | 243 | 14 | 1 | 2.036 | 13.59 | 61.81 | 24.59 |
| | 245 | 12 | 1 | 2.068 | 11.77 | 62.42 | 25.80 |
| | 246 | 9 | 2 | 2 070 | 12.02 | 62.79 | 25.17 |
| Average...... ...................... | | 11 | | 2.066 | 11.89 | 62.26 | 25.92 |
| Number............................. | 11 | | 13-12 | ....... | ....... | ...... | ....... |
| **EXHIBIT OF TEETH OF PERSONS FIFTEEN YEARS OLD AND UNDER TWENTY, INCLUSIVE.** | 178 | 18 | 2 | 2.079 | 10.60 | 62.76 | 26.62 |
| | 188 | 16 | 1 | 2.067 | 12.67 | 61.71 | 25.61 |
| | 199 | 19 | 1 | 2.082 | 11.22 | 63,26 | 25.50 |
| | 201 | 18 | 1 | 2.102 | 10.42 | 64.20 | 25.37 |
| | 208 | 18 | 1 | 2.080 | 10.85 | 63.65 | 25.48 |
| | 218 | 16 | 1 | 2.078 | 11.99 | 62.83 | 25.15 |
| | 220 | 16 | 1 | 2.078 | 12.29 | 63.45 | 24.24 |
| | 244 | 16 | 1 | 2.080 | 11.68 | 63.59 | 24.72 |
| Average............................ | | 17 | | 2.080 | 11.46 | 63.18 | 25.33 |
| Number ......................... ... . | 8 | | 9 | ....... | ....... | ....... | ....... |
| **EXHIBIT OF TEETH OF PERSONS TWENTY YEARS OLD AND UNDER TWENTY-FIVE, INCLUSIVE.** | 150 | 21 | 6 | 2.087 | 11.26 | 62.90 | 25.82 |
| | 154 | 20 | 2 | 2.074 | 10.90 | 62.89 | 26.19 |
| | 162 | 20 | 1 | 2.098 | 11.40 | 63.83 | 24 75 |
| | 165 | 22 | 1 | 2.106 | 10.97 | 64,53 | 24.48 |
| | 171 | 20 | 1 | 2.098 | 11.72 | 63.70 | 24.56 |
| | 176 | 20 | 4 | 2.092 | 10.91 | 64.49 | 24.66 |
| | 179 | 23 | 1 | 2.093 | 10.61 | 63.78 | 25.60 |
| | 181 | 22 | 1 | 2.081 | 12.01 | 63,18 | 24.80 |
| | 182 | 23 | 1-0 | 2.055 | 12.24 | ....... | ....... |
| | 185 | 20 | 1 | 2.074 | 11.54 | 63.43 | 25.02 |
| | 186 | 20 | 1 | 2 068 | 11.19 | 63.77 | 26.02 |
| | 189 | 24 | 11-10 | 2.105 | 10.99 | 63.63 | 25.51 |
| | 204 | 20 | 1 | 2.042 | 11.56 | 62.01 | 26.41 |
| | 210 | 22 | 1-0 | 2.054 | 12.95 | ...... | ....... |
| | 221 | 23 | 1 | 2.100 | 10.91 | 64.39 | 24.68 |
| | 222 | 22 | 5 | 2.082 | 11.72 | 63.24 | 25.01 |
| | 223 | 23 | 6 | 2.070 | 11.66 | 62.82 | 25.50 |
| | 228½ | 24 | 1-0 | 2.068 | 11.52 | ....... | ....... |
| | 229 | 22 | 1-0 | 2.105 | 11.40 | ...... | ....... |
| | 241 | 20 | 1 | 2.072 | 12 01 | 63.36 | 24.61 |
| Average............................ | | 21.55 | | 2.081 | 11.47 | 63 43 | 25.22 |
| Number ........................... | 20 | | 48-43 | ....... | ....... | ....... | ....... |
| **EXHIBIT OF TEETH OF PERSONS TWENTY-FIVE YEARS OLD AND UNDER THIRTY, INCLUSIVE.** | 144 | 25 | 1 | 2.062 | 11.81 | 61.82 | 26.36 |
| | 146½ | 25 | 1 | 2.092 | 10.86 | 63.44 | 25.68 |
| | 148 | 25 | 1 | 2.097 | 10.43 | 62.76 | 26.79 |
| | 151 | 28 | 1 | 2.086 | 12.23 | 64.50 | 23.26 |
| | 153 | 25 | 2 | 2.085 | 10.15 | 63.53 | 26.25 |
| | 158 | 28 | 1 | 2.049 | 11.42 | 63.67 | 24.90 |
| | 173 | 25 | 11-7 | 2.098 | 10.90 | 63.80 | 25.20 |
| | 183 | 25 | 1 | 2.105 | 10.94 | 63.00 | 26.05 |
| | 191 | 25 | 14 | 2.104 | 11.03 | 64.45 | 24.49 |
| | 200 | 27 | 1 | 2.098 | 11.54 | 64.77 | 23.67 |
| | 205 | 28 | 2 | 2.056 | 12.23 | 62.60 | 25.67 |
| | 213 | 25 | 1 | 2.080 | 11.69 | 63.01 | 25.28 |
| | 216 | 26 | 3 | 2.101 | 10.51 | 63.33 | 26.16 |
| | 247 | 27 | 1 | 2.104 | 11.25 | 64.79 | 23.95 |
| | 248 | 25 | 2 | 2.080 | 12.12 | 62.23 | 25.63 |
| Average...... ...................... | | 25.93 | | 2.086 | 11.27 | 63.44 | 25.28 |
| Number............................ | 15 | | 43.39 | ....... | ....... | ....... | ....... |

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* Cases in which the percentage of lime-salts and organic matter were not obtained the number of teeth in each,—*i.e.*, specific gravity and percentage of water in one group, and percentage of lime-salts and organic matter in the other, is given.

| Teeth of Persons Twenty Years Old and Under Thirty, Inclusive. | Case. | Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| Average | | | | 2.083 | ....... | 63.44 | ...... |
| Males | 12 | 24.1 | | 2.082 | ...... | 63.30 | ...... |
| Females | 23 | 23 | | 2.083 | ....... | 63.51 | ....... |
| Exhibit of Teeth of Persons Thirty Years Old and Under Forty, Inclusive. | 142 | 32 | 16-15 | 2.098 | 10.65 | 63.62 | 25.54 |
| | 143 | 30 | 10 | 2.096 | 10.41 | 63.75 | 25.71 |
| | 149 | 30 | 1 | 2.084 | 10.56 | 63.47 | 25.95 |
| | 155 | 30 | 1 | 2.093 | 12.47 | 62.95 | 24.56 |
| | 156 | 30 | 1 | 2.080 | 10.40 | 62.58 | 27.01 |
| | 159 | 38 | 1 | 2.074 | 11.55 | 62.43 | 26.01 |
| | 160 | 30 | 2-1 | 2.072 | 10.80 | 62.50 | 26.64 |
| | 161 | 38 | 1 | 2.089 | 10.00 | 63.57 | 26.42 |
| | 163 | 30 | 1 | 2.097 | 11.47 | 63.47 | 25.04 |
| | 164 | 35 | 1 | 2.070 | 12.02 | 62.73 | 25.23 |
| | 167 | 30 | 1 | 2.101 | 10.48 | 63.19 | 26.32 |
| | 177 | 35 | 2 | 2.095 | 11.12 | 62.81 | 25.91 |
| | 180 | 35 | 1 | 2.107 | 10.48 | 64.00 | 25.51 |
| | 187 | 35 | 3 | 2.079 | 10.78 | 62.83 | 26.36 |
| | 190 | 38 | 7 | 2.082 | 11.76 | 63.52 | 24.64 |
| | 194 | 30 | 1 | 2.101 | 10.14 | 63.71 | 26.14 |
| | 196 | 35 | 1 | 2.096 | 10.20 | 64.11 | 25.66 |
| | 198 | 35 | 1 | 2.123 | 10.07 | 64.77 | 25.15 |
| | 203 | 35 | 1 | 2.082 | 11.61 | 63.31 | 25.06 |
| | 206 | 35 | 1 | 2.092 | 9.90 | 63.81 | 26.28 |
| | 215 | 35 | 2-0 | 2.121 | 10 15 | ....... | ....... |
| | 217 | 36 | 7 | 2.104 | 10.14 | 63.57 | 26.30 |
| | 230 | 35 | 6 | 2.088 | 11.44 | 63.68 | 24.86 |
| | 237 | 31 | 1 | 2.100 | 10.50 | 64.11 | 25.37 |
| | 239 | 30 | 1 | 2.080 | 11.74 | 63.01 | 25.24 |
| | 240 | 30 | 1 | 2.106 | 11.06 | 64.17 | 24.76 |
| Average | | 33 | | 2.092 | 10.84 | 63.42 | 25.66 |
| Number | 26 | | 72-68 | ....... | ....... | ....... | ....... |
| Males | 12 | 33.83 | | 2.090 | ...... | 63.35 | ....... |
| Females | 14 | 31.92 | | 2.094 | ....... | 63.48 | ....... |
| Exhibit of Teeth of Persons Forty Years Old and Under Fifty, Inclusive. | 145 | 45 | 4 | 2.091 | 10.59 | 62.85 | 26.15 |
| | 152 | 40 | 1 | 2.094 | 11.28 | 62.52 | 26.18 |
| | 157 | 40 | 4 | 2.093 | 10.58 | 62.92 | 26.47 |
| | 168 | 40 | 1 | 2.085 | 11.28 | 64.51 | 24.12 |
| | 169 | 40 | 6 | 2.103 | 10.90 | 63.80 | 25.27 |
| | 175 | 45 | 5-2 | 2.089 | 10.92 | 63.82 | 25.85 |
| | 192 | 44 | 10 | 2.092 | 11.54 | 63.64 | 24.81 |
| | 197 | 40 | 2 | 2.096 | 10.02 | 64.01 | 25.87 |
| | 202 | 40 | 1 | 2.072 | 11.83 | 63.99 | 24.17 |
| | 227 | 49 | 1 | 2.105 | 11.12 | 64.53 | 24.33 |
| | 228 | 42 | 2-1 | 2.104 | 9.98 | 64.06 | 25.95 |
| | 231 | 47 | 1 | 2.103 | 10.92 | 64.13 | 24.94 |
| Average | | 42.66 | | 2.094 | 10.91 | 63.73 | 25.34 |
| Number | 12 | | 38.34 | ....... | ....... | ....... | ....... |
| Males | 6 | 42.16 | | 2.093 | ....... | 63.54 | ....... |
| Females | 6 | 43.16 | | 2.094 | ....... | 63.92 | ....... |
| Exhibit of Teeth of Persons Fifty Years Old and Under Sixty, Inclusive. | 170 | 50 | 1 | 2.080 | 11.61 | 63.27 | 25.11 |
| | 174 | 51 | 7-6 | 2.113 | 10.14 | 64.64 | 25.16 |
| | 184 | 55 | 2 | 2.120 | 10.59 | 64.46 | 24.93 |
| | 193 | 50 | 1 | 2.109 | 10.46 | 64.66 | 24.86 |
| | 209 | 58 | 1 | 2.100 | 11.47 | 63.61 | 24.91 |
| | 225 | 51 | 1 | 2.121 | 10.61 | 62.08 | 27.30 |
| | 235 | 55 | 1 | 2.091 | 10.42 | 63.19 | 26.38 |
| | 238 | 55 | 3 | 2.099 | 11.29 | 63.56 | 25.13 |
| | 242 | 54 | 1 | 2.117 | 10.69 | 64.58 | 24.73 |
| | 250 | 51 | 1 | 2.103 | 11.22 | 64.29 | 24.48 |
| Average | | 53 | | 2.105 | 10.85 | 63.83 | 25.29 |
| Number | 10 | | 19-18 | ....... | ....... | ....... | ....... |

| Exhibit of Teeth of Persons Sixty Years Old and Over. | Case. | Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| | 172 | 63 | 1 | 2.124 | 10.62 | 64.42 | 24.95 |
| | 195 | 61 | 3 | 2.114 | 9.64 | 63.96 | 26.38 |
| | 214 | 60 | 1 | 2.106 | 11.00 | 64.68 | 24.30 |
| | 219 | 72 | 3 | 2.087 | 11.66 | 63.42 | 24.90 |
| | 224 | 61 | 1 | 2.099 | 10.82 | 64.25 | 24.91 |
| | 226 | 63 | 1 | 2.104 | 10.27 | 68.24 | 21.48 |
| | 232 | 65 | 1 | 2.119 | 10.45 | 64.10 | 25.44 |
| | 233 | 60 | 14 | 2.093 | 11.54 | 63.35 | 25.10 |
| | 249 | 71 | 1 | 2.131 | 10.00 | 64.67 | 25.32 |
| | 234 | 60 | 1 | 2.122 | 10.02 | 64.57 | 25.40 |
| Average………………………… | | 63.60 | | 2.109 | 10.60 | 64.56 | 24.81 |
| Number………………………… | 10 | | 27 | ……. | ……. | ……. | ……. |
| Exhibit of Cases in which the Teeth were Lost because of Disease of the Peridental Membrane. | 161 | 38 | 1 | 2.089 | 10.00 | 63.57 | 26.42 |
| | 168 | 40 | 1 | 2.085 | 11.28 | 64.51 | 24.12 |
| | 169 | 40 | 6 | 2.103 | 10.90 | 63.80 | 25.27 |
| | 184 | 55 | 2 | 2.120 | 10.59 | 64.46 | 24.93 |
| | 190 | 38 | 7 | 2.082 | 11.76 | 63.52 | 24.64 |
| | 192 | 44 | 10 | 2.092 | 11.54 | 63.64 | 24.81 |
| | 193 | 50 | 1 | 2.109 | 10.46 | 64.66 | 24.86 |
| | 195 | 61 | 3 | 2.114 | 9.64 | 63.96 | 26.38 |
| | 202 | 40 | 1 | 2.072 | 11.83 | 63.99 | 24.17 |
| | 209 | 58 | 1 | 2.100 | 11.47 | 63.61 | 24.91 |
| | 224 | 61 | 1 | 2.099 | 10.82 | 64.25 | 24.91 |
| | 225 | 51 | 1 | 2.121 | 10.61 | 62.08 | 27.30 |
| | 233 | 60 | 14 | 2.093 | 11.54 | 63.35 | 25.10 |
| | 234 | 60 | 1 | 2.122 | 10.02 | 64.57 | 25.40 |
| | 242 | 54 | 1 | 2.117 | 10.69 | 64.58 | 24.73 |
| Average……………………………… | | 50 | | 2.101 | 10.88 | 63.90 | 25.19 |
| Number……………………………… | 15 | | 51 | ……. | ……. | ……. | ……. |

### EXHIBIT OF CASES OF FOUR OR MORE TEETH FROM ONE PERSON, INCLUDING VARIATIONS IN SPECIFIC GRAVITY AND IN PERCENTAGE OF LIME-SALTS.

| | Case. | Age. | No. of Teeth. | Average Specific Gravity. | Plus or Minus General Average for Age. | Variations among the Teeth. | Per cent. of Water. | Average Per cent. of Lime Salts. | Plus or Minus General Average of Lime Salts for Age. | Variations of Lime Salts among the Teeth. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 142 | 32 | 16 | 2.098 | +.006 | .065 | 10.65 | 63.62 | + .20 | 1 77 | 25.54 |
| | 143 | 30 | 10 | 2.096 | +.006 | .023 | 10.41 | 63.75 | + .33 | 2.80 | 25.71 |
| | 145 | 45 | 4 | 2.091 | —.003 | .007 | 10.59 | 62.85 | — .88 | .21 | 26.15 |
| | 150 | 21 | 6 | 2.087 | +.006 | .034 | 11.26 | 62.90 | — .57 | 1.33 | 25.82 |
| | 157 | 40 | 4 | 2.093 | .000 | .028 | 10.58 | 62.92 | — .81 | .78 | 26.47 |
| | 169 | 40 | 6 | 2.103 | +.010 | .046 | 10.90 | 63.80 | — .02 | 1.13 | 25.27 |
| | 173 | 25 | 11 | 2.098 | +.012 | .050 | 10.90 | 63 80 | + .42 | .94 | 25.20 |
| | 174 | 51 | 7 | 2.113 | +.009 | .022 | 10.14 | 64.64 | + .81 | 1.45 | 25.16 |
| | 175 | 45 | 5 | 2.089 | —.007 | .021 | 10.92 | 63.82 | + .04 | 1.02 | 25 85 |
| | 176 | 20 | 4 | 2.092 | +.012 | .019 | 10.91 | 64.49 | + .97 | 2.01 | 24.66 |
| | 189 | 24 | 11 | 2.105 | +.020 | .047 | 10.99 | 63.63 | — .04 | 1.17 | 25.51 |
| | 190 | 38 | 7 | 2.082 | — 010 | .028 | 11.76 | 63.52 | + .10 | 1.45 | 24.64 |
| | 191 | 25 | 14 | 2.104 | +.018 | .050 | 11.03 | 64.45 | +1.07 | 1.49 | 24.49 |
| | 192 | 44 | 10 | 2.092 | —.001 | .045 | 11.54 | 63.64 | — .09 | 2.53 | 24.81 |
| | 217 | 36 | 7 | 2.104 | —.012 | .024 | 10.14 | 63.57 | + .15 | .79 | 26.30 |
| | 222 | 22 | 5 | 2.082 | .000 | .036 | 11.72 | 63.24 | — .23 | 1.09 | 25.01 |
| | 223 | 23 | 6 | 2.070 | —.012 | .028 | 11.66 | 62.82 | — .65 | 1.69 | 25.50 |
| | 230 | 35 | 6 | 2.088 | —.004 | .034 | 11.44 | 63 68 | — .30 | 1.36 | 24.86 |
| | 233 | 60 | 14 | 2.093 | —.013 | .052 | 11.54 | 63.35 | —1.21 | 1.72 | 25.10 |
| Number……. | 19 | …… | 153 | ……. | …… | …… | ……. | ……. | …… | …… | ……. |
| Average……. | … | 34.52 | …… | 2.093 | .. … | …… | 11.00 | 63.64 | …… | …… | 25.37 |
| Highest……. | … | …… | …… | 2.113 | .020 | .065 | 11.76 | 64.64 | 1.07 | 2.80 | 26.47 |
| Lowest……… | … | …… | …… | 2.070 | .012 | .007 | 10.14 | 62.82 | 1.21 | .21 | 24.49 |
| Greatest Difference | … | …… | …… | .043 | …… | …… | 1.62 | 1.82 | …… | …… | 1.98 |

| | Case. | Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| EXHIBIT OF CASES IN WHICH THE TEETH ARE CLASSED AS BAD,—*i.e.*, RAPIDLY DECAYING. | 142 | 32 | 16-15 | 2.098 | 10.65 | 63.62 | 25.54 |
| | 143 | 30 | 10 | 2.096 | 10.41 | 63.75 | 25.71 |
| | 147 | 13 | 1 | 2.043 | 12.29 | 61.08 | 26.66 |
| | 150 | 21 | 6 | 2.087 | 11.26 | 62.90 | 25.82 |
| | 154 | 20 | 2 | 2.074 | 10.90 | 62.89 | 26.19 |
| | 173 | 25 | 11-7 | 2.098 | 10.90 | 63.80 | 25.20 |
| | 174 | 51 | 7-6 | 2.113 | 10.14 | 64.64 | 25.16 |
| | 175 | 45 | 5-2 | 2.089 | 10.92 | 63.82 | 25.85 |
| | 176 | 20 | 4-3 | 2.092 | 10.91 | 64.49 | 24.66 |
| | 184 | 55 | 2 | 2.120 | 10.59 | 64.46 | 24.93 |
| | 185 | 20 | 1 | 2.074 | 11.54 | 63.43 | 25.02 |
| | 186 | 20 | 1 | 2.068 | 11.19 | 62.77 | 26.02 |
| | 187 | 35 | 3 | 2.079 | 10.78 | 62.83 | 26.36 |
| | 188 | 16 | 1 | 2.067 | 12.67 | 61.71 | 25.61 |
| | 191 | 25 | 14 | 2.104 | 11.03 | 64.45 | 24.49 |
| | 208 | 18 | 1 | 2.080 | 10.85 | 63.65 | 25.48 |
| | 211 | 11 | 1-0 | 2.061 | 12.87 | ....... | ....... |
| | 212 | 10 | 1 | 2.064 | 12,60 | 61.77 | 25.62 |
| | 215½ | 9 | 1 | 2.092 | 11.83 | 63.81 | 24.30 |
| | 216 | 26 | 3 | 2.101 | 10.51 | 63.33 | 26.16 |
| | 217 | 36 | 7 | 2.104 | 10.14 | 63.57 | 26.30 |
| | 220 | 16 | 1 | 2.078 | 12.29 | 63 45 | 24.24 |
| | 222 | 22 | 5 | 2.082 | 11.72 | 63.24 | 25.01 |
| | 223 | 23 | 6 | 2.070 | 11 66 | 62.82 | 25.50 |
| | 229 | 22 | 1-0 | 2.105 | 11.40 | ....... | ....... |
| | 235 | 55 | 1 | 2.091 | 10.42 | 63.19 | 26 38 |
| | 236 | 10 | 1 | 2.072 | 11.30 | 62.85 | 25.83 |
| | 237 | 31 | 1 | 2.100 | 10.50 | 64.11 | 25.37 |
| | 238 | 55 | 3 | 2.099 | 11.29 | 63.56 | 25.13 |
| | 239 | 30 | 1 | 2.080 | 11.74 | 63.01 | 25.24 |
| | 248 | 25 | 2 | 2.080 | 12,12 | 62.23 | 25.63 |
| | 249 | 71 | 1 | 2.131 | 11.00 | 64.67 | 25.32 |
| Average........................... | | 28 | | 2.087 | 11.25 | 63.33 | 25.49 |
| Number........... ............... | 32 | | 121-112 | ....... | ....... | ....... | ....... |
| EXHIBIT OF CASES IN WHICH THE TEETH ARE CLASSED AS GOOD,—*i.e.*, LITTLE CARIES OCCURRING. | 144 | 25 | 1 | 2 062 | 11.81 | 61.82 | 26.36 |
| | 146 | 8 | 1 | 2.076 | 11.11 | 61.29 | 27.59 |
| | 148 | 25 | 1 | 2.097 | 10.43 | 62.76 | 26.79 |
| | 149 | 30 | 1 | 2.084 | 10.56 | 63.47 | 25.95 |
| | 155 | 30 | 1 | 2.093 | 12 47 | 62.95 | 24.56 |
| | 156 | 30 | 1 | 2.080 | 10.40 | 62.58 | 27.01 |
| | 160 | 30 | 2-1 | 2.072 | 10.80 | 62.50 | 26.64 |
| | 161 | 38 | 1 | 2.089 | 10.00 | 63.57 | 26.42 |
| | 162 | 20 | 1 | 2.098 | 11.40 | 63.83 | 24.75 |
| | 163 | 30 | 1 | 2.097 | 11.47 | 63.47 | 25.04 |
| | 164 | 35 | 1 | 2.070 | 12.02 | 62.73 | 25.23 |
| | 165 | 22 | 1 | 2.106 | 10.97 | 64.53 | 24.48 |
| | 166 | 13 | 2 | 2.074 | 10.86 | 62.39 | 26.68 |
| | 167 | 30 | 1 | 2.101 | 10.48 | 63.19 | 26.32 |
| | 168 | 40 | 1 | 2.085 | 11.28 | 64.51 | 24.12 |
| | 169 | 40 | 6 | 2.103 | 10.90 | 63.80 | 25.27 |
| | 170 | 50 | 1 | 2.088 | 11.61 | 63.27 | 25.11 |
| | 171 | 20 | 1 | 2.098 | 11.72 | 63.70 | 24.56 |
| | 177 | 35 | 2 | 2.095 | 11.12 | 62.81 | 25.91 |
| | 178 | 18 | 2 | 2.079 | 10.60 | 62.76 | 26.62 |
| | 179 | 23 | 1 | 2.093 | 10.61 | 63.78 | 25.60 |
| | 180 | 35 | 1 | 2.107 | 10.48 | 64.00 | 25.51 |
| | 181 | 22 | 1 | 2.081 | 12.01 | 63.18 | 24.80 |
| | 182 | 23 | 1-0 | 2.055 | 12.24 | ....... | ....... |
| | 183 | 25 | 1 | 2.105 | 10.94 | 63.00 | 26.05 |
| | 190 | 38 | 7 | 2.082 | 11.76 | 63.52 | 24.64 |
| | 193 | 50 | 1 | 2.109 | 10.46 | 64.66 | 24.86 |
| | 194 | 30 | 1 | 2.101 | 10.14 | 63.71 | 26.14 |
| | 195 | 61 | 3 | 2.114 | 9.64 | 63.96 | 26.38 |
| | 196 | 35 | 1 | 2.096 | 10.20 | 64.11 | 25.66 |
| | 197 | 40 | 2 | 2.096 | 10.02 | 64.01 | 25.87 |
| | 199 | 19 | 1 | 2.082 | 11.22 | 63.26 | 25.50 |
| | 200 | 27 | 1 | 2.098 | 11.54 | 64.77 | 23.67 |
| | 201 | 18 | 1 | 2.102 | 10.42 | 64.20 | 25.37 |
| | 202 | 40 | 1 | 2.072 | 11.83 | 63.99 | 24.17 |
| | 203 | 35 | 1 | 2.082 | 11.61 | 63.31 | 25.06 |
| | 204 | 20 | 1 | 2.042 | 11.56 | 62.01 | 26.41 |
| | 205 | 28 | 2 | 2.056 | 12.23 | 62.60 | 25.67 |
| | 209 | 58 | 1 | 2.100 | 11.47 | 63.61 | 24.91 |
| | 210 | 22 | 1-0 | 2.054 | 12.95 | ...... | ....... |
| | 213 | 25 | 1 | 2.080 | 11.69 | 63.01 | 25.28 |

| | Case. | Age. | No. of Teeth. | Specific Gravity. | Per cent of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| EXHIBIT OF CASES IN WHICH THE TEETH ARE CLASSED AS GOOD,—*i.e.*, LITTLE CARIES OCCURRING.—*Continued.* | 214 | 60 | 1 | 2.106 | 11.00 | 64.68 | 24.30 |
| | 215 | 31 | 2-0 | 2.121 | 10.15 | . . | ....... |
| | 218 | 16 | 1 | 2.078 | 11.99 | 62.83 | 25.15 |
| | 219 | 72 | 3 | 2.087 | 11.66 | 63.42 | 24.90 |
| | 221 | 23 | 1 | 2.100 | 10.91 | 64.39 | 24.68 |
| | 224 | 61 | 1 | 2.099 | 10.82 | 64.25 | 24.91 |
| | 225 | 51 | 1 | 2.121 | 10.61 | 62.08 | 27.30 |
| | 226 | 63 | 1 | 2.104 | 10 27 | 68.24 | 21.48 |
| | 227 | 49 | 1 | 2.105 | 11.12 | 64.53 | 24.33 |
| | 228 | 42 | *2-1 | 2.104 | 9.98 | 64.06 | 25.95 |
| | 230 | 35 | 6 | 2.088 | 11.44 | 63.68 | 24.86 |
| | 232 | 65 | 1 | 2.119 | 10.45 | 64.10 | 25.44 |
| | 233 | 60 | 14 | 2.093 | 11.54 | 63.35 | 25.10 |
| | 234 | 60 | 1 | 2.122 | 10.02 | 64.57 | 25.40 |
| | 240 | 30 | 1 | 2.106 | 11.06 | 64.17 | 24.76 |
| | 241 | 20 | 1 | 2.072 | 12.01 | 63.36 | 24.61 |
| | 242 | 54 | 1 | 2.117 | 10.69 | 64.58 | 24.73 |
| | 243 | 14 | 1 | 2.036 | 13.59 | 61.81 | 24.59 |
| | 244 | 16 | 1 | 2.080 | 11.68 | 63.59 | 24.72 |
| | 245 | 12 | 1 | 2.068 | 11.77 | 62.42 | 25.80 |
| | 246 | 9 | 2 | 2.070 | 12.02 | 62.79 | 25.17 |
| | 247 | 27 | 1 | 2.104 | 11.25 | 64.79 | 23.95 |
| Average............................ | | 33.53 | | 2.090 | 11.16 | 63.53 | 25.31 |
| Number............................ | 63 | | 105-100 | ....... | ....... | . ..... | . ..... |
| EXHIBIT OF CASES IN WHICH THE TEETH ARE CLASSED AS FAIR. | 145 | 45 | 4 | 2.091 | 10.59 | 62.85 | 26.15 |
| | 151 | 28 | 1 | 2.086 | 12.23 | 64.50 | 23.26 |
| | 152 | 40 | 1 | 2.094 | 11.28 | 62.52 | 26.18 |
| | 153 | 25 | 2 | 2.085 | 10.15 | 63.53 | 26.25 |
| | 157 | 40 | 4 | 2.093 | 10.58 | 62.92 | 26.47 |
| | 158 | 28 | 1 | 2.049 | 11.42 | 63.67 | 24.90 |
| | 159 | 38 | 1 | 2.074 | 11.55 | 62.43 | 26.01 |
| | 172 | 63 | 1 | 2.124 | 10.62 | 64.42 | 24.95 |
| | 189 | 24 | 11-10 | 2.105 | 10.99 | 63.63 | 25.51 |
| | 192 | 44 | 10 | 2.092 | 11.54 | 63.64 | 24.81 |
| | 198 | 35 | 1 | 2.123 | 10.07 | 64.77 | 25.15 |
| | 206 | 35 | 1 | 2.092 | 9.90 | 63.81 | 26.28 |
| | 207 | 12 | 1 | 2.073 | 10.62 | 62.40 | 26.97 |
| | 228½ | 24 | 1-0 | 2.068 | 11.52 | ...... | ....... |
| | 231 | 47 | 1 | 2.103 | 10.92 | 64.13 | 24.94 |
| | 250 | 51 | 1 | 2.103 | 11.22 | 64.29 | 24.48 |
| Average............................ | | 36.19 | | 2.090 | 10.95 | 63.56 | 25.48 |
| Number............. .............. | 16 | | 42-40 | ....... | ....... | ....... | ....... |

## EXHIBIT OF CASES CLASSED AS GOOD, AND AS BAD, IN YOUNG, MIDDLE-AGED, AND OLD PERSONS, FOOTINGS ONLY.

Plus or minus marks show the variation of those classed as bad from those classed as good.

| | Cases. | Average Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| Cases under 25 years old classed as good............... | 20 | 17.9 | †23-21 | 2.077 | 11.58 | 63.06 | 25.38 |
| Cases under 25 years old classed as bad............... | 15 | 17 | 33-31 | 2.076 | 11.64 | 63.01 | 25.41 |
| Difference..... ................... | | —.9 | | —.001 | +0.6 | —.05 | —.03 |
| Cases 25 years old and under 40 classed as good. | 25 | 30.72 | 40-38 | 2.090 | 11.09 | 63.33 | 25.55 |
| Cases 25 years old and under 40 classed as bad. | 9 | 28.88 | 65-60 | 2.095 | 10.86 | 63.54 | 25.51 |
| Difference......................... | | —1.84 | | —.005 | —.23 | +.21 | +.04 |
| Cases 40 years old and over classed as good...... | 21 | 54 | 45-44 | 2.103 | 10.83 | 64.21 | 24.95 |
| Cases 40 years old and over classed as bad.. ..... | 6 | 55.3 | 19-13 | 2.110 | 10.56 | 64.05 | 25.44 |
| Difference......................... | | +1.3 | | +.007 | —.27 | —.16 | +.49 |

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* The specific gravity only of one of these teeth was obtained.

† The second figures give the number of teeth in which the percentage of lime-salts and organic matter was obtained.

## EXHIBIT OF PERFECT TEETH.

| Case. | Age. | Tooth. | Pulp: Living or Dead. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| 142 | 32 | /4 | l | 2.096 | 10.46 | 63.89 | 25 63 |
| | | /7 | l | 2.104 | 10.96 | 63.61 | 25.41 |
| | | 4/ | l | 2.084 | 10.52 | 62.96 | 26.51 |
| | | 8/ | l | 2.092 | 11.25 | 62.73 | 26.00 |
| | | 7/ | l | 2.124 | 10.60 | 65.12 | 24.27 |
| | | /3 | l | 2.084 | 10.92 | 62.81 | 26.25 |
| | | /8 | l | 2.113 | 11.10 | 63.70 | 25.19 |
| | | /5 | l | 2.111 | 10.53 | 63.98 | 25.47 |
| 143 | 30 | /3 | l | 2.106 | 10.72 | 64.25 | 25.01 |
| | | /8 | l | 2.105 | 10.22 | 64.55 | 25.21 |
| | | 3/ | l | 2.093 | 10.44 | 63 66 | 25.88 |
| | | 8/ | l | 2.108 | 9.88 | 64.82 | 25.28 |
| | | /1 | l | 2.079 | 11.32 | 62.02 | 26.65 |
| | | 1/ | l | 2.092 | 10.76 | 62.97 | 26.26 |
| | | H/ | l | 2.104 | 10.03 | 64.18 | 25.77 |
| | | /H | l | 2.093 | 10.15 | 64.21 | 25.62 |
| 145 | 45 | /3 | l | 2.089 | 10.22 | 63.05 | 26.71 |
| | | /1 | l | 2.092 | 10.59 | 62.85 | 26.55 |
| | | 6/ | l | 2.088 | 10.99 | 63.06 | 25.93 |
| | | 3/ | l | 2.095 | 10.59 | 62.45 | 26.95 |
| 147 | 13 | 3 | l | 2.043 | 12.29 | 61.08 | 26.66 |
| 157 | 40 | /4 | l | 2.079 | 10.53 | 62.93 | 26.53 |
| | | D/ | l | 2.095 | 10.29 | 62.44 | 27.26 |
| 160 | 30 | C | l | 2.083 | 10.85 | 62.50 | 26.64 |
| 161 | 38 | B | l | 2.089 | 10.00 | 63.57 | 26.42 |
| 165 | 22 | H | l | 2.106 | 10.97 | 64.53 | 24.48 |
| 166 | 13 | 4/ | l | 2 078 | 10.72 | 62.22 | 26.96 |
| | | /4 | l | 2.071 | 11.01 | 62.57 | 26.41 |
| 169 | 40 | 1/ | l | 2.109 | 10.95 | 64.00 | 25.04 |
| | | /1 | l | 2.081 | 11.50 | 63.34 | 25.15 |
| | | 2/ | l | 2.100 | 10.65 | 63.58 | 25.76 |
| | | /2 | l | 2.099 | 11.22 | 63.42 | 25.35 |
| | | /3 | l | 2.127 | 10.15 | 64.47 | 25.37 |
| 173 | 25 | 1/ | l | 2.095 | 11.11 | 63.32 | 25.56 |
| | | /1 | l | 2.099 | 10.65 | 63.65 | 25.68 |
| | | 3/ | l | 2.081 | 11.24 | 63.67 | 25.08 |
| | | /3 | l | 2.102 | 10.77 | 64.26 | 24.95 |
| | | /6 | l | 2 095 | 10.98 | ....... | ....... |
| | | /8 | l | 2.098 | 11.27 | 63.60 | 25.69 |
| 174 | 51 | 8 | l | 2.123 | 10.34 | ....... | ....... |
| 175 | 45 | 8/ | l | 2.085 | 10.84 | ....... | ....... |
| 176 | 20 | 4/ | l | 2.088 | 10.99 | 63.74 | 25.25 |
| 177 | 35 | 1/ | l | 2.088 | 11.09 | 62.47 | 26.15 |
| | | 2/ | l | 2.102 | 11.16 | 63.15 | 25.68 |
| 178 | 18 | 4/ | l | 2.081 | 10.10 | 62.66 | 27.23 |
| | | /4 | l | 2.078 | 11.11 | 62.87 | 26.01 |
| 180 | 35 | /8 | l | 2.107 | 10.48 | 64.00 | 25.51 |
| 181 | 22 | 8/ | d | 2.081 | 12.01 | 63.18 | 24.80 |
| 182 | 23 | A/ | d | 2.055 | 12.24 | ....... | ....... |
| 183 | 25 | /H | l | 2.105 | 10.94 | 63.00 | 26.05 |
| 184 | 55 | /B | l | 2.112 | 10.94 | 64.42 | 24.63 |
| 189 | 24 | /3 | l | 2.097 | 10.94 | 63.91 | 25.13 |
| | | 3/ | l | 2.110 | 10.75 | 63.36 | 25.68 |
| | | /4 | l | 2.098 | 10.35 | 63.64 | 26.00 |
| | | 4/ | l | 2.117 | 10.74 | 63.76 | 25.49 |
| | | 5/ | l | 2.114 | 11.25 | 63.54 | 25.21 |
| | | 8/ | l | 2.105 | 12 04 | 63.67 | 24.27 |
| | | /8 | l | 2.121 | 10.53 | ....... | ....... |
| 190 | 38 | /1 | l | 2.075 | 11.89 | 63.83 | 24.22 |
| | | /7 | l | 2.089 | 11.28 | 63 50 | 25.21 |
| | | /8 | l | 2.086 | 11.71 | 64.04 | 24.24 |
| | | 8/ | l | 2.099 | 11.65 | 63.97 | 24.37 |
| 191 | 25 | 3/ | l | 2.108 | 11.22 | 63.54 | 25.22 |
| | | 5/ | l | 2.089 | 11.10 | 64.61 | 24.27 |
| | | /5 | l | 2.107 | 11.19 | 64.79 | 24.01 |
| | | /6 | l | 2.099 | 11.52 | 64.58 | 23.89 |
| 192 | 44 | 3/ | l | 2.106 | 11.31 | 63.80 | 24.88 |
| | | 4/ | l | 2.096 | 11.33 | 63.97 | 24.68 |
| | | 7/ | l | 2.111 | 10.77 | 64.51 | 24.71 |
| | | /7 | l | 2.098 | 11.19 | 64.26 | 24.53 |
| 193 | 50 | 6 | l | 2.109 | 10.46 | 64.66 | 24.86 |
| 195 | 61 | 3/ | l | 2.118 | 9 58 | 63.07 | 27.33 |
| | | 8/ | l | 2.112 | 9.62 | 64.16 | 26.21 |
| 198 | 35 | 8/ | l | 2.123 | 10.07 | 64.77 | 25.15 |
| 199 | 19 | /B | l | 2.082 | 11.22 | 63.26 | 25.50 |

### EXHIBIT OF PERFECT TEETH.—*Continued.*

| | Case. | Age. | Tooth. | Pulp: Living or Dead. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| | 200 | 27 | H/ | l | 2.098 | 11.54 | 64.77 | 23.67 |
| | 202 | 40 | /F | l | 2.072 | 11.83 | 63.99 | 24.17 |
| | 209 | 58 | 7/ | d | 2.106 | 11.47 | 63.61 | 24.91 |
| | 219 | 72 | 1/ | l | 2.099 | 11.79 | 63.05 | 25.15 |
| | 223 | 23 | /2 | l | 2.057 | 11.66 | 62.91 | 25.42 |
| | 224 | 61 | 7/ | l | 2.099 | 10.82 | 64.25 | 24.91 |
| | 230 | 35 | /5 | l | 2.102 | 11.52 | 63.39 | 26.08 |
| | | | /1 | l | 2.068 | 11.08 | 63.33 | 25.57 |
| | | | 3/ | l | 2.074 | 12.15 | 63.27 | 24.56 |
| | | | /7 | l | 2.097 | 11.35 | 64.63 | 24.01 |
| | | | 7/ | l | 2.087 | 11.53 | 63.94 | 24.52 |
| | 233 | 60 | 2/ | l | 2.108 | 10.76 | 63.73 | 25.48 |
| | | | /2 | l | 2.098 | 12.05 | 63.36 | 24.57 |
| | | | /3 | l | 2.091 | 11.76 | 63.78 | 24.45 |
| | | | 3/ | l | 2.095 | 11.30 | 63.84 | 24.84 |
| | | | /4 | l | 2.088 | 11.56 | 62.95 | 25.84 |
| | | | /1 | d | 2.110 | 11.37 | 62.83 | 25.79 |
| | | | 1/ | l | 2.075 | 11.92 | 63.43 | 24.63 |
| | | | 4/ | l | 2.086 | 11.31 | 63.22 | 25.46 |
| | | | 5/ | l | 2.059 | 12.16 | 62.25 | 25.57 |
| | | | 6/ | l | 2.086 | 12.19 | 63.52 | 24.27 |
| | | | /6 | d | 2.093 | 11.74 | 63.62 | 24.63 |
| | | | /7 | l | 2.109 | 11.16 | 63.94 | 24.89 |
| | | | 7/ | l | 2.097 | 11.24 | 63.59 | 25.15 |
| | | | D/ | l | 2.111 | 11.08 | 63.97 | 24.94 |
| | 234 | 60 | 6/ | l | 2.122 | 10.02 | 64.57 | 25.40 |
| | 241 | 20 | 6/ | l | 2.072 | 12.01 | 63.36 | 24.61 |
| | 242 | 54 | /6 | l | 2.117 | 10.69 | 64.58 | 24.73 |
| Number............ | 42 | | 103 | | | | | |
| Average ............ | | 36.26 | | | 2.095 | 11.03 | 63.59 | 25.36 |

### EXHIBIT OF CARIOUS TEETH.

| Case. | Age. | Tooth. | Pulp: Living or Dead. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| 142 | 32 | /1 | l | 2.085 | 10.45 | ....... | ....... |
| | | /2 | d | 2.062 | 11.07 | 63.84 | 25.08 |
| | | /F | l | 2.113 | 10.19 | 63.99 | 25.81 |
| | | 1/ | l | 2.103 | 9.95 | 63.77 | 26.27 |
| | | 2/ | d | 2.074 | 10.56 | 63.23 | 26.20 |
| | | 3/ | l | 2.099 | 10.86 | 63.82 | 25.30 |
| | | F/ | d | 2.104 | 10.81 | 64.48 | 24.69 |
| | | /G | l | 2.127 | 10.28 | 64.50 | 25.16 |
| 143 | 30 | 5/ | l | 2.085 | 10.11 | 63.54 | 26.33 |
| | | /G | l | 2.096 | 10.54 | 63.31 | 25.14 |
| 144 | 25 | 8 | d | 2.062 | 11.81 | 61.82 | 26.36 |
| 146 | 8 | 1 | l | 2.076 | 11.11 | 61.29 | 27.59 |
| 146 ½ | 25 | 8 | l | 2.092 | 10.86 | 63.44 | 25.68 |
| 148 | 25 | 5 | l | 2.097 | 10.43 | 62.76 | 26.79 |
| 149 | 30 | 8 | l | 2.084 | 10.56 | 63.47 | 25.95 |
| 150 | 21 | 1/ | l | 2.073 | 11.73 | 62.94 | 25.32 |
| | | /2 | d | 2.097 | 11.54 | 63.12 | 25.33 |
| | | 4/ | d | 2.078 | 11.16 | 62.58 | 26.24 |
| | | /1 | d | 2.067 | 12.44 | 62.05 | 25.49 |
| | | 5/ | d | 2.106 | 11.10 | 63.38 | 25.51 |
| | | /5 | l | 2.101 | 9.57 | 63.37 | 27.05 |
| 151 | 28 | H | d | 2.086 | 12.23 | 64.50 | 23.26 |
| 152 | 40 | 8 | l | 2.094 | 11.28 | 62.52 | 26.18 |
| 153 | 25 | H | l | 2.079 | 10.45 | 63.94 | 25.60 |
| | | 8 | l | 2.092 | 9.96 | 63.13 | 26.90 |
| 154 | 20 | B | l | 2.080 | 10.39 | 63.04 | 26.56 |
| | | D | l | 2.068 | 11.41 | 62.75 | 25.83 |
| 155 | 30 | D | d | 2.093 | 12.47 | 62.95 | 24.56 |
| 156 | 30 | F | d | 2.080 | 10.40 | 62.58 | 27.01 |
| 157 | 40 | 7 | d | 2.094 | 10.56 | 63.12 | 26.31 |
| | | F | d | 2.107 | 10.97 | 63.22 | 25.79 |
| 158 | 28 | H | d | 2.049 | 11.42 | 63.67 | 24.90 |

EXHIBIT OF CARIOUS TEETH.—*Continued.*

| Case. | Age. | Tooth. | Pulp: Living or Dead. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| 159 | 38 | 4 | d | 2.074 | 11.55 | 62.43 | 26.01 |
| 160 | 30 | 7 | d | 2.068 | 10.75 | ....... | ....... |
| 162 | 20 | 6 | d | 2.098 | 11.40 | 63.83 | 24.75 |
| 163 | 30 | 4 | d | 2.097 | 11.47 | 63.47 | 25.04 |
| 164 | 35 | 8 | d | 2.070 | 12.02 | 62.73 | 25.23 |
| 167 | 30 | 5 | l | 2.101 | 10.48 | 63.19 | 26.32 |
| 168 | 40 | G | l | 2.085 | 11.28 | 64.51 | 24.12 |
| 169 | 40 | 3/ | l | 2.104 | 10.94 | 64.04 | 25.00 |
| 170 | 50 | C | l | 2.088 | 11.61 | 63.27 | 25.11 |
| 171 | 20 | F | d | 2.098 | 11.72 | 63.70 | 24.56 |
| 172 | 63 | 8 | l | 2.124 | 10.62 | 64.42 | 24.95 |
| 173 | 25 | 2/ | l | 2.092 | 10.27 | 63.98 | 25.73 |
| | | 6/ | d | 2.085 | 11.67 | 64.18 | 24.15 |
| | | /7 | l | 2.110 | 10.73 | ....... | ....... |
| | | /8 | l | 2.131 | 10.52 | ....... | ....... |
| | | /G | l | 2.095 | 10.73 | ....... | ....... |
| 174 | 51 | 3/ | l | 2.122 | 9.71 | 64.55 | 25.38 |
| | | /3 | l | 2.101 | 10.37 | 64.47 | 25.14 |
| | | 2/ | l | 2.107 | 10.05 | 64.41 | 25.53 |
| | | /2 | l | 2.101 | 10.76 | 64.02 | 25.21 |
| | | 4/ | l | 2.123 | 9.81 | 65.47 | 24.66 |
| | | 5/ | l | 2.114 | 9.98 | 64.97 | 25.04 |
| 175 | 45 | 3/ | d | 2.078 | 11.84 | ....... | ....... |
| | | /8 | d | 2.099 | 11.29 | ....... | ....... |
| | | D/ | l | 2.089 | 10.05 | 64.33 | 25.60 |
| | | E/ | l | 2.096 | 10.58 | 63.31 | 26.10 |
| 176 | 20 | /1 | l | 2.087 | 11.09 | ....... | ....... |
| | | 1/ | l | 2.090 | 11.13 | 63.90 | 24.96 |
| | | /2 | l | 2.106 | 10.45 | 65.75 | 23.79 |
| 179 | 23 | 4/ | l | 2.093 | 10.61 | 63.78 | 25.60 |
| 184 | 55 | C | d | 2.128 | 10.25 | 64.50 | 25.23 |
| 185 | 20 | 6 | d | 2.074 | 11.54 | 63.43 | 25.02 |
| 186 | 20 | D | d | 2.068 | 11.19 | 62.77 | 26.02 |
| 187 | 35 | 3/ | d | 2.080 | 11.27 | 63.34 | 25.37 |
| | | /3 | l | 2.070 | 10.79 | 62.56 | 26.64 |
| | | 4/ | l | 2.087 | 10.30 | 62.61 | 27.07 |
| 188 | 16 | 5/ | l | 2.067 | 12.67 | 61.71 | 25.61 |
| 189 | 24 | /1 | l | 2.078 | 10.97 | 63.51 | 25.50 |
| | | /2 | l | 2.108 | 11.14 | 63.85 | 25.00 |
| | | 2/ | l | 2.088 | 11.52 | 63.58 | 24.88 |
| | | 7/ | l | 2.125 | 11.01 | 64.53 | 24.45 |
| 190 | 38 | 3/ | l | 2.079 | 11.07 | 63.46 | 24.45 |
| | | /3 | l | 2.071 | 11.85 | 62.59 | 25.54 |
| | | 7/ | l | 2.074 | 12.30 | 63.26 | 24.43 |
| 191 | 25 | 1/ | d | 2.105 | 10.59 | 64.19 | 25.20 |
| | | /1 | l | 2.083 | 10.94 | 63.88 | 25.15 |
| | | 2/ | d | 2.096 | 10.96 | 64.21 | 25.24 |
| | | 3/ | l | 2.109 | 11.20 | 64.78 | 24.01 |
| | | 4/ | l | 2.101 | 11.34 | 64.29 | 24.35 |
| | | 6/ | l | 2.110 | 11.07 | 64.77 | 24.14 |
| | | 8/ | l | 2.133 | 11.25 | 65.03 | 23.71 |
| | | /8 | l | 2.117 | 10.90 | 65.00 | 24.09 |
| | | 7/ | l | 2.106 | 10.67 | 64.70 | 24.62 |
| 192 | 44 | 1/ | l | 2.087 | 12.25 | 62.04 | 25.69 |
| | | 2/ | l | 2.066 | 11.08 | 63.74 | 25.17 |
| | | /3 | l | 2.080 | 11.94 | 63.56 | 24.44 |
| | | /4 | l | 2.108 | 10.80 | 63.74 | 25.44 |
| | | 6/ | l | 2.098 | 11.29 | 64.57 | 24.12 |
| | | /6 | l | 2.068 | 13.44 | 62.05 | 24.45 |
| 194 | 30 | F | d | 2.101 | 10.14 | 63.71 | 26.14 |
| 195 | 61 | /8 | d | 2.113 | 9.72 | 64.66 | 25.60 |
| 196 | 35 | 6 | l | 2.096 | 10.20 | 64.11 | 25.66 |
| 197 | 40 | A/ | d | 2.087 | 10.00 | 63.98 | 26.04 |
| | | B/ | l | 2.105 | 10.04 | 64.04 | 25.91 |
| 201 | 18 | D | d | 2.102 | 10.42 | 64.20 | 25.37 |
| 203 | 35 | 8 | d | 2.082 | 11.61 | 63.31 | 25.06 |
| 204 | 20 | 8 | l | 2.042 | 11.56 | 62.01 | 26.41 |
| 205 | 28 | /8 | l | 2.070 | 11.61 | 63.19 | 25.18 |
| | | 8/ | d | 2.043 | 12.80 | 62.01 | 25.17 |
| 206 | 35 | /F | d | 2.092 | 9.90 | 63.81 | 26.28 |
| 207 | 12 | F | l | 2.073 | 10.62 | 62.40 | 26.97 |
| 208 | 18 | F/ | l | 2.080 | 10.85 | 63.65 | 25.48 |
| 210 | 22 | H | l | 2.054 | 12.95 | ....... | ....... |
| 211 | 11 | /F | d | 2.061 | 12.87 | ....... | ....... |
| 212 | 10 | F/ | l | 2.064 | 12.60 | 61.77 | 25.62 |

EXHIBIT OF CARIOUS TEETH.—*Continued.*

| | Case. | Age. | Tooth. | Pulp: Living or Dead. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|---|
| | 213 | 25 | F/ | l | 2.080 | 11.69 | 63.01 | 25.28 |
| | 214 | 60 | /F | d | 2.106 | 11.00 | 64.68 | 24.30 |
| | 215 | 31 | E | l | 2.126 | 10.07 | ....... | ....... |
| | | | F | l | 2.117 | 10.23 | ....... | ....... |
| | 215½ | 9 | /F | l | 2.092 | 11.83 | 63.81 | 24.30 |
| | 216 | 26 | /5 | l | 2.098 | 9.98 | 63.18 | 26.92 |
| | | | /6 | l | 2.099 | 11.03 | 63.31 | 25.64 |
| | | | 7/ | l | 2.107 | 10.52 | 63.52 | 25.94 |
| | 217 | 36 | /3 | d | 2.105 | 9.57 | 63.89 | 26.72 |
| | | | 3/ | l | 2.111 | 10.47 | 63.35 | 26.16 |
| | | | /1 | l | 2.095 | 10.55 | 63.43 | 26.01 |
| | | | 4/ | l | 2.090 | 10.59 | 63.26 | 26.21 |
| | | | /4 | l | 2.114 | 9.32 | 64.05 | 26.62 |
| | | | 7/ | l | 2.108 | 10.22 | 63.77 | 26.00 |
| | | | 1/ | l | 2.108 | 10.26 | 63.28 | 26.44 |
| | 218 | 16 | 6/ | d | 2.078 | 11.99 | 62.83 | 25.15 |
| | 219 | 72 | F/ | d | 2.053 | 12.15 | 62.85 | 24.99 |
| | | | /3 | l | 2.110 | 11.05 | 64.37 | 24.56 |
| | 220 | 16 | F | d | 2.078 | 12.29 | 63.45 | 24.24 |
| | 221 | 23 | F | l | 2.100 | 10.91 | 64.39 | 24.68 |
| | 222 | 22 | /4 | l | 2.098 | 11.05 | 63.86 | 25.12 |
| | | | /5 | l | 2.087 | 11.53 | 63.46 | 25.00 |
| | | | 4/ | l | 2.075 | 12.14 | 62.48 | 25.37 |
| | | | 6/ | l | 2.090 | 11.92 | 63.57 | 24.50 |
| | | | /C | d | 2.062 | 11.98 | 62.93 | 25.07 |
| | 223 | 23 | 1/ | l | 2.058 | 11.87 | 63.10 | 25.01 |
| | | | 2/ | d | 2.074 | 11.53 | 61.63 | 26.83 |
| | | | 6/ | l | 2.085 | 11.44 | 63.32 | 25.26 |
| | | | /6 | d | 2.067 | 11.80 | 63.27 | 24.91 |
| | | | 4/ | l | 2.079 | 11.70 | 62.72 | 25.57 |
| | 225 | 51 | 2/ | d | 2.121 | 10.61 | 62.08 | 27.30 |
| | 226 | 63 | /6 | l | 2.104 | 10.27 | 68.24 | 21.48 |
| | 227 | 49 | G/ | l | 2.105 | 11.12 | 64.53 | 24.33 |
| | 228 | 42 | /H | l | 2.101 | ....... | ....... | ....... |
| | | | /E | d | 2.108 | 9.98 | 64.06 | 25.95 |
| | 228½ | 24 | /H | l | 2.068 | 11.52 | ....... | ....... |
| | 229 | 22 | /5 | l | 2.105 | 11.40 | ....... | ....... |
| | 230 | 35 | /4 | l | 2.101 | 11.02 | 63.54 | 25.43 |
| | 231 | 47 | F/ | d | 2.103 | 10.92 | 64.13 | 24.94 |
| | 232 | 65 | /8 | l | 2.119 | 10.45 | 64.10 | 25.44 |
| | 235 | 55 | /5 | d | 2.091 | 10.42 | 63.19 | 26.38 |
| | 236 | 10 | /F | d | 2.072 | 11.30 | 62.85 | 25.83 |
| | 237 | 31 | G/ | l | 2.100 | 10.50 | 64.11 | 25.37 |
| | 238 | 55 | 1/ | l | 2.098 | 11.37 | 63.87 | 24.74 |
| | | | 2/ | l | 2.102 | 11.45 | 63.47 | 25.06 |
| | | | /5 | l | 2.099 | 11.05 | 63.35 | 25.59 |
| | 239 | 30 | 4/ | l | 2.080 | 11.47 | 63.01 | 25.24 |
| | 240 | 30 | 6/ | l | 2.106 | 11.06 | 64.17 | 24.76 |
| | 243 | 14 | F/ | l | 2.036 | 13.56 | 61.81 | 24.59 |
| | 244 | 16 | /F | d | 2.080 | 11.68 | 63.59 | 24.72 |
| | 245 | 12 | /F | l | 2.068 | 11.77 | 62.42 | 25.80 |
| | 246 | 9 | F/ | d | 2.072 | 11.87 | 62.70 | 25.35 |
| | | | /F | l | 2.069 | 12.17 | 62.83 | 24.99 |
| | 247 | 27 | 6/ | l | 2.104 | 11.25 | 64.79 | 23.95 |
| | 248 | 25 | 1/ | l | 2.067 | 12.59 | 61.98 | 25.42 |
| | | | 3/ | l | 2.094 | 11.65 | 62.49 | 25.85 |
| | 249 | 71 | /F | l | 2.131 | 10.00 | 64.67 | 25.32 |
| | 250 | 51 | /6 | l | 2.103 | 11.22 | 64.29 | 24.48 |
| Number.............. | 91 | | 165 | | | | | |
| Average.............. | | 31.5 | | | 2.091 | 11.06 | 63.50 | 25.36 |

## EXHIBIT OF COMPARATIVE RESULTS FROM PERFECT TEETH AND FROM CARIOUS TEETH IN YOUNG, MIDDLE-AGED, AND OLD PERSONS, FOOTINGS ONLY.

Plus and minus marks show variations of carious from perfect teeth.

| | Case. | Average Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| Perfect teeth under 25 years old | 11 | 19.72 | 19 | 2.087 | 11.20 | 63.19 | 25.59 |
| Carious teeth under 25 years old | 33 | 17.66 | 51 | 2.080 | 11.53 | 63.13 | 25.37 |
| Difference | | —2.06 | | —.007 | +.33 | —.06 | +.22 |
| Difference due to difference in age | | | | +.003 | —.06 | +.22 | —.13 |
| Actual difference | | | | —.004 | +.27 | +.16 | +.09 |
| Perfect teeth 25 years old and under 40 | 13 | 32 | 43 | 2.096 | 10.96 | 63.73 | 25.31 |
| Carious teeth 25 years old and under 40 | 36 | 29.92 | 70 | 2.094 | 10.89 | 63.57 | 25.51 |
| Difference | | 2.08 | | —.002 | —.07 | —.16 | +.20 |
| Difference due to difference in age | | | | +.001 | —.05 | .00 | —. 5 |
| Actual difference | | | | —.001 | —.02 | —.16 | +.15 |
| Perfect teeth 40 years old and over | 15 | 52 | 41 | 2.098 | 11.05 | 63.60 | 25.39 |
| Carious teeth 40 years old and over | 24 | 52 | 43 | 2.100 | 10.84 | 64.00 | 25.18 |
| Difference | | 0 | | +.002 | —.19 | +.40 | —.21 |
| Difference due to difference in age | | | | 0 | 0 | 0 | 0 |
| Actual difference | | | | +.002 | —.19 | +.40 | —.21 |

## EXHIBIT OF ELASTICITY AND CRUSHING STRESSES OF BLOCKS OF DENTINE EIGHT-HUNDREDTHS OF AN INCH SQUARE. ARRANGED ACCORDING TO THE AGE OF PERSONS.

| Case. | Age. | Tooth. | Carious or Perfect. | Pulp Living or Dead. | Specific Gravity. | Per Cent. of Lime-Salts. | Elasticity at 100 lbs. | Elasticity at 150 lbs. | Crushing Stress. | Average of Stresses. |
|---|---|---|---|---|---|---|---|---|---|---|
| 246 | 9 | /F | c | l | 2.069 | 62.83 | 1.5 | 3 | 285 | |
| 212 | 10 | F/ | c | l | 2.064 | 61.77 | 3 | 5 | 235 | |
| 211 | 11 | /F | c | d | 2.061 | ....... | 2 | 4 | 247 | |
| 207 | 12 | /F | c | l | 2 073 | 62.40 | 2 | 3 | 240 | |
| 245 | 12 | /F | c | l | 2.068 | 62.42 | 1.5 | 3 | 235 | 248 |
| 183 | 16 | F/ | c | l | 2.067 | 61.71 | 2 | 4 | 275 | |
| 218 | 16 | 6/ | c | d | 2.078 | 62.83 | 2 | 3.5 | 225 | |
| 214 | 16 | /F | c | d | 2.080 | 63.59 | 2 | 5 | 210 | |
| 208 | 18 | /F | c | l | 2.080 | 63.65 | 3 | 5 | 210 | 230 |
| 210 | 22 | H/ | c | l | 2.054 | ....... | 1.5 | 3.5 | 302.5 | |
| 222 | 22 | /4 | c | l | 2.098 | 63.80 | 2.5 | 4.5 | 235 | |
| 229 | 22 | /5 | c | l | 2.105 | ....... | 3 | 4.5 | 245 | |
| 221 | 23 | F | c | l | 1.100 | 64.39 | 2 | 3 | 270 | |
| 223 | 23 | 6/ | c | l | 2.085 | 63.32 | 3 | 5 | 220 | |
| | | /6 | c | d | 2.067 | 63.27 | 2 | 4 | 235 | |
| | | /4 | c | l | 2.079 | 62.72 | 2 | 4 | 270 | |
| 228½ | 24 | /H | c | l | 2.068 | ....... | 2.5 | 4.5 | 245 | |
| 173 | 25 | /7 | c | l | 2.110 | ....... | .... | .... | 260 | |
| | | /8 | c | l | 2.131 | ....... | .... | .... | 216 | |
| | | /G | c | l | 2.095 | ....... | .... | .... | 275 | |
| 213 | 25 | F/ | c | l | 2.050 | 63.01 | 2 | 4 | 280 | |

EXHIBIT OF ELASTICITY AND CRUSHING STRESSES OF BLOCKS OF DENTINE EIGHT-HUNDREDTHS OF AN INCH SQUARE. ARRANGED ACCORDING TO THE AGE OF PERSONS.—*Continued.*

| | Case. | Age. | Tooth. | Carious or Perfect. | Pulp Living or Dead. | Specific Gravity. | Per Cent. of Lime. Salts. | Elasticity at 100 lbs. | Elasticity at 150 lbs. | Crushing Stress. | Average of Stresses. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 216 | 26 | /6 | c | l | 2.099 | 63.31 | 2 | 3 | 235 | |
| | 200 | 27 | H/ | p | l | 2.098 | 64.77 | 2 | 4 | 270 | |
| | 247 | 27 | 6/ | c | l | 2 104 | 64.79 | 1 | 2.5 | 285 | |
| | 205 | 28 | /8 | c | l | 2.070 | 63.19 | 1.5 | 3 | 300 | |
| | | | 8/ | c | d | 2.043 | 62.01 | 2 | 4 | 260 | 260 |
| | 194 | 30 | /F | c | d | 2.101 | 63.71 | 2 | 4 | 250 | |
| | 215 | 31 | E | c | l | 2.126 | ....... | 2.5 | 4 | 245 | |
| | | | F | c | d | 2.117 | ....... | 2.5 | 4.5 | 230 | |
| | 196 | 35 | 6/ | c | l | 2.096 | 64.11 | 2 | 4 | 250 | |
| | 198 | 35 | 8/ | c | l | 2.123 | 64.77 | 2 | 4 | 255 | |
| | 203 | 35 | 8/ | c | d | 2.082 | 63.31 | 2 | 4 | 225 | |
| | 230 | 35 | /5 | p | l | 2.102 | 63.39 | 3 | 4.5 | 265 | |
| | | | 3/ | p | l | 2.074 | 63.27 | 2.5 | 4.5 | 245 | |
| | | | /7 | p | l | 2.097 | 64.63 | 2 | 4 | 252 | |
| | | | 7/ | p | l | 2.087 | 63.94 | 3 | 5 | 250 | |
| | 217 | 36 | 7/ | c | l | 2.108 | 63.77 | 5 | 8 | 200 | 242 |
| | 202 | 40 | /F | p | l | 2.072 | 63.99 | 2 | 4 | 225 | |
| | 228 | 42 | /H | c | l | 2.101 | ....... | 3 | 5 | 262 | |
| | | | /E | c | d | 2.108 | 64.06 | 3 | 7 | 200 | |
| | 192 | 44 | 4/ | p | l | 2.096 | 63.97 | 2 | 4 | 240 | |
| | | | /4 | c | l | 2.108 | 63.74 | 3 | 6 | 250 | |
| | | | /6 | c | l | 2.068 | 62.05 | 2.5 | 5 | 250 | |
| | | | 7/ | p | l | 2.111 | 64.51 | 2 | 4 | 265 | |
| | | | /7 | p | l | 2.098 | 64.26 | 2.5 | 5 | 220 | |
| | 175 | 45 | /3 | c | d | 2.078 | ....... | .... | .... | 183 | |
| | | | /8 | c | d | 2.099 | ....... | .... | .... | 178 | |
| | | | 8/ | p | l | 2.085 | ....... | .... | .... | 225 | |
| | 231 | 47 | F/ | c | d | 2.103 | 64.13 | 3 | 4.5 | 200 | |
| | 227 | 49 | G/ | c | l | 2.105 | 64.53 | 3 | 5 | 220 | 224 |
| | 193 | 50 | 6/ | p | l | 2.109 | 64.66 | 2.5 | 5 | 220 | |
| | 174 | 51 | 8/ | p | l | 2.123 | ....... | .... | .... | 207 | |
| | 250 | 51 | /6 | c | l | 2.103 | 64.29 | 1.5 | 3 | 235 | |
| | 209 | 58 | 7/ | p | l | 2.100 | 63.61 | 2 | 4 | 215 | 219 |
| | 214 | 60 | /F | c | d | 2.106 | 64.68 | 2 | 4 | 230 | |
| | 233 | 60 | /3 | p | l | 2.091 | 63.78 | 2 | 4 | 200 | |
| | | | 3/ | p | l | 2.095 | 63.84 | 2 | 4 | 215 | |
| | | | /4 | p | l | 2.088 | 62.95 | 1.5 | 3 | 210 | |
| | | | 4/ | p | l | 2.096 | 63.22 | 2.5 | 4.5 | 220 | |
| | | | 5/ | p | l | 2.059 | 62.25 | 2.5 | 5 | 195 | |
| | | | 6/ | p | l | 2.086 | 63.59 | 2 | 4 | 200 | |
| | | | /6 | p | d | 2 093 | 63.62 | 1.5 | 3 | 260 | |
| | | | /7 | p | l | 2.109 | 63.94 | 2.5 | 4.5 | 250 | |
| | | | 7/ | p | l | 2.097 | 63.59 | 1.5 | 3 | 250 | |
| | 234 | 60 | 6/ | p | l | 2.122 | 64.57 | 1 | 2 5 | 290 | |
| | 195 | 61 | 3/ | p | l | 2.118 | 63.07 | 2 | 5 | 260 | |
| | | | 8/ | p | l | 2.112 | 64.16 | 2 | 4 | 235 | |
| | | | /8 | c | d | 2.113 | 64.16 | 3 | 6 | 225 | |
| | 226 | 63 | /6 | c | l | 2 104 | 68.24 | 8 | 1.2 | 185 | |
| | 232 | 65 | /8 | c | l | 2.119 | 64.10 | 2 | 3 | 215 | 227 |
| Average..... | | | | | | | | 2.09 | 4.3 | 238 | |
| Number..... | 46 | | 70 | | | | | | | | |

## GENERAL SUMMARY OF RESULTS.

| | No. of Cases. | Average Age. | No. of Teeth. | Specific Gravity. | Per cent. of Water. | Per cent. of Lime Salts. | Per cent. of Organic Matter. |
|---|---|---|---|---|---|---|---|
| Average for total number of teeth | 111 | 32.33 | 268 | 2.092 | 11.06 | 63.54 | 25.36 |
| The highest percentage | | | | 2.133 | 13.56 | 65.75 | 27.59 |
| The lowest percentage | | | | 2.036 | 9.32 | 61.08 | 23.26 |
| Greatest variation | | | | .097 | 4.24 | 4.67 | 4.33 |
| Average for persons under 15 years old | 11 | 11. | 13 | 2.066 | 11.89 | 62.26 | 25.92 |
| Average for persons 15 years old and under 20 | 8 | 17. | 9 | 2.080 | 11.46 | 63.18 | 25.33 |
| Average for persons 20 years old and under 25 | 20 | 21.55 | 48 | 2.081 | 11.47 | 63.43 | 25.23 |
| Average for persons 25 years old and under 30 | 15 | 25.93 | 43 | 2.086 | 11.27 | 63.44 | 25.28 |
| Average for persons 30 years old and under 40 | 26 | 33. | 72 | 2.092 | 10.84 | 63.42 | 25.66 |
| Average for persons 40 years old and under 50 | 12 | 42.66 | 38 | 2.094 | 10.91 | 63.73 | 25.34 |
| Average for persons 50 years old and under 60 | 10 | 53. | 19 | 2.105 | 10.85 | 63.83 | 25.29 |
| Average for persons 60 years and over | 10 | 63.60 | 27 | 2.109 | 10.66 | 64.56 | 24.81 |
| Average for males 20 years old and under 30 | 12 | | 24 | 2.082 | ....... | 63.30 | ....... |
| Average for females 20 years old and under 30 | 26 | | 67 | 2.083 | ....... | 63.51 | ....... |
| Average for males 30 years old and under 40 | 12 | | 18 | 2.090 | ....... | 63.35 | ....... |
| Average for females 30 years old and under 40 | 14 | | 54 | 2.094 | ....... | 63.48 | ....... |
| Average for males 40 years old and under 50 | 6 | | 19 | 2.093 | ....... | 63.54 | ....... |
| Average for females 40 years old and under 50 | 6 | | 19 | 2.094 | ...... | 63.92 | ....... |
| Increase due to age | | | | .043 | ....... | 2.30 | ....... |
| Decrease due to age | | | | ....... | 1.29 | ....... | 1.12 |
| Average for persons who lost their teeth from diseases of the peridental membranes | 15 | 50 | 51 | 2.101 | 10.88 | 62.90 | 25.19 |
| Average for cases in which the teeth are classed as bad | 32 | 28 | 121 | 2.087 | 11.25 | 63.33 | 25.49 |
| Average for cases in which the teeth are classed as good | 63 | 33.53 | 105 | 2.090 | 11.16 | 63.53 | 25.31 |
| Average for cases in which the teeth are classed as fair | 16 | 36.19 | 42 | 2.090 | 10.95 | 63.56 | 25.48 |
| Average for perfect teeth | 42 | 36.26 | 103 | 2.095 | 11.03 | 63.59 | 25.36 |
| Average for carious teeth | 91 | 31.5 | 165 | 2.091 | 11.06 | 62.50 | 25.36 |

## General Review of the Results.

Perhaps to many in the profession anything that I may write as to the results of this investigation will be superfluous, as they will prefer to derive their own deductions from the general table of results. This is at once their privilege and duty. I do not expect to be able to bring out all that this tabulation can teach us of the human teeth. But to the majority, perhaps I can, after the study I have made of the subject, suggest directions of thought that will assist in the formation of correct conclusions. Some of this will necessarily, as it seems to me, be at variance with the prevailing thought of the profession, while some of the findings will be confirmatory of the deductions derived from clinical observation.

Perhaps the general reader on first entering upon the study of the tables will be struck with the close similarity of the specific gravities of the teeth. The range is very limited indeed, being only ninety-seven-thousandths of a volume in one hundred and eleven persons, including all possible errors. I think the thought of the profession derived from clinical observation has been that the teeth of individuals presented strong personal characteristics as to density, and the relative amount of lime-salts and organic matter they contained; or in other words, the thought has been that some persons had teeth that were much denser than those of others, and that the basis of this difference was the relative amount of lime-salts and organic matter. A study of the results shows that there is a difference, but it is so slight as to be almost nil.

*But there is a difference between the individual teeth of the same person* that is much greater than the difference in averages of the teeth of different persons. Take the first number in the general table, No. 142 (sixteen teeth from one person). The upper right central incisor has a specific gravity of 2.085, while the left standing beside it, and apparently under exactly similar conditions of development and nutrition, has a specific gravity of 2.103, a difference of eighteen-thousandths of a volume. On running along down the column of specific gravities, one is struck with the wide variation in this individual, amounting to sixty-five-thousandths of a volume, while the greatest variation found in the teeth from one hundred and eleven persons was only ninety-seven-thousandths of a volume. There is, therefore, a little more than two-thirds as much variation in the teeth of this individual as in teeth from one hundred and twelve persons, including all ages. But this will be presented more in detail later.

The reader can readily search out other differences of this nature in the tables. A ramble through the cases presented with this idea in view will give a clear impression of the differences in density that occur in the teeth of the same mouth.

It will be noted that while in the main the percentage of lime-salts agrees with the specific gravity, there are many cases in which they seem not to correspond. This failure of correspondence was noted early in the work, and was thought to be a result of some error in the findings. This urged me to greater and greater efforts in the direction of exactness, but the apparent incongruity continued to crop out to the last. I have, therefore, been forced to the conclusion that the specific gravity of a tooth does not depend wholly on the weight of the lime-salts it may contain; and, as we shall find later, its strength or ability to withstand heavy pressure without fracture or crushing is also not directly dependent on its percentage of lime-salts. The whole range of the variation in the percentage of lime-salts is, with the exception of one abnormal case which will be noticed later, 4.67 per cent., or from 61.08 per cent. to 65.57 per cent., the general average from the footings of individual teeth being 63.54 per cent. How little the effect of this should be as to hardness or softness of the teeth, can be better appreciated by comparing human dentine with ivory, or dentine from the tusk of the elephant, which, according to the few determinations I have had opportunity to make, gives an average of 47.06 per cent. of lime-salts, 16.42 per cent. less than in human dentine, and yet the difference in hardness does not seem to be very notable. This range in the percentage of lime-salts in the human teeth does not, therefore, seem to be sufficiently great to be of much consequence as to hardness or softness, and yet it has some effect. This, however, is very much less than seems to have been thought by the profession, judging from expressions found in the literature. The idea prevalent that caries of the teeth was in some way due to, or favored by, a lack of lime-salts has evidently tended to the maintenance of the notion that teeth which were rapidly melting down with caries were soft or poorly calcified, while those that remained free from caries were dense.

The free water is an essential element of the tooth. It is found to be variable, and is greatest in youth, diminishing with age. I was unable, after careful experiment, to find a fixed line between free water and the water of crystallization by the temperature process. The plan and extent of the drying must be regarded as a *condition* of this experimental work rather than as an exhibit of the exact amount of free water contained in the dentine, though the figures must represent the whole amount very closely. After twelve hours in the drying-oven at 200° F., I found that an increase of 20° for two hours more would remove more water. Another slight increase would remove a very little more, and so on till the beginning of carbonization. Drying in vacuo would probably have given different results. The proportion of water is in fair agreement with the density and percentage of lime-salts, the lighter teeth containing more water, and the heavier less. The general average is very nearly eleven per cent. Teeth that have lost their pulps are very variable in the amount of water, those that have become darkened generally containing more than the normal amount.

The organic matter is found from footings of the individual teeth to average 25.36 per cent. This diminishes as the density increases, but not with perfect regularity. After the work I have done with the teeth, I have come to regard the organic matrix of the tooth as much more important than I had formerly considered it. The *condition* of the organic matter seems to have much to do with the strength of the tooth, and is a matter that needs further investigation. This will be further discussed in connection with pulpless teeth, and in considering the strength of the teeth.

With this brief citation, the skillful reader may be able to study the main features of the general table of results intelligently, and make his own deductions. But perhaps the majority will find the array of figures very confusing, and will do best to study, in their normal order, the exhibits which I present, before attempting any considerable study of the general table of results. I would say, further, that the reader should carefully study each of the exhibits during his reading, in order to obtain the best knowledge of the thought presented; for, in order not to take up too much space, I must necessarily be brief, noticing only the more important features, and leaving much of the detail to be made out from the general table and the exhibits. It must be remembered that this general table is simply a copy of the results from my notes, and is therefore entirely without order of arrangement. It is presented in this way so that any who may wish may collate from it and draw their own deductions with perfect freedom from any direction of thought that may be given by any order of arrangement that I may suggest.

## CHANGES THAT OCCUR IN THE TEETH WITH AGE.

I have made out separate exhibits of the results for those persons under fifteen years old, those between fifteen and twenty, those between twenty and twenty-five, those between twenty-five and thirty, those between thirty and forty, those between forty and fifty, those between fifty and sixty, and for those sixty years old and over. The average footings for each of these classes is made from the averages for the person, in case there is more than one tooth, instead of making up the footings from the individual teeth. The average age of the persons in each class is also given.

From the study of these exhibits, it is found that there is practically a continuous increase in the density of the teeth, and in the percentage of the lime-salts they contain, from youth to old age. The amount of that increase is well shown. The average specific gravity begins with 2.066 for the average age of eleven years, and ends with the average of 2.109 for the average age of sixty-three years. This gives a difference of forty-three thousandths of a volume. The increase in the lime-salts, though less regular, follows the same rule. Beginning with 62.26 per cent. for the average age of eleven years, it increases to an average of 64.56 per cent. for the average age of sixty-three years. This is an increase of 2.3 per cent. This result confirms the hypothesis arrived at from clinical observation,—namely, that the density of the teeth increases from childhood to adult age. But it does more. It shows that the increase continues practically during life, and that in this respect the teeth are similar to the bones. The increase in the specific gravity is found to be much the greatest in early youth, or up to the age of seventeen years, being from 2.066 at the average age of eleven years, to 2.080 at the average age of seventeen years. After this time the increase is slower until near the age of fifty, at which time it is again more rapid. This increase in density is much too slight to be appreciable by ordinary modes of examination.

In the first of my tabulations (before I had so many persons) there was an apparent diminution of the density and of the percentage of lime-salts between the ages of twenty and forty years. This depression became less apparent, however, as the numbers increased, and finally the depression in density disappeared. But the advance in density seems to be checked somewhat in the period between twenty and forty. Still, after watching the progress of the work, I have the feeling that if the number of cases were considerably increased this would in some degree disappear, so that the advance would be more steady. However, as it stands there is shown a sharp check in the advance of the density during the years from twenty to forty. During the same period the percentage of lime-salts shows no increase. In the ages between twenty-five and thirty it rises one-hundredth of one per cent. In the ages from thirty to forty it falls two-hundredths of one per cent., being one-hundredth of one per cent. below that for the average age of twenty-one years. In the decade from forty to fifty, however, it increases to 63.73 per cent., or thirty-one hundredths of one per cent., and the increase continues in the following decades. After a somewhat careful study of this result, I am not of the opinion that there is an actual loss of lime-salts in the teeth of the individual at the age indicated, but I am inclined to the notion that a larger collection of individuals, or a larger number of teeth from each, would show only a decided check in the increase in the percentage of lime-salts.

This check in the increase of both the density and the percentage of lime-salts, occurring as it does in the age of child-bearing, and about two-thirds of the persons whose teeth were examined being females, suggested the thought that it might confirm the hypothesis entertained by many, that the teeth of women become soft on account of a loss of lime-salts during pregnancy and lactation. I therefore made a division of the sexes between the ages of twenty and fifty years. In the period between twenty and thirty, the density of the teeth was found to be one-thousandth of a volume greater, and the lime-salts twenty-one hundredths of one per cent. greater in the females. In the period between thirty and forty, the density was four-thousandths of a volume, and the percentage of lime-salts was three-hundredths of one per cent. greater in the females. In the period between forty and fifty, the density was one-thousandth of a volume, and the percentage of lime-salts was forty-eight hundredths of one per cent. greater in the females. In a division of the entire number of males and females, the lime-salts were found about equal. It is therefore found that the check in the increase in density and in the percentage of the lime-salts of the teeth during this period belongs so nearly in equal degree to men and women that it is practically the same.

I found it impossible to get teeth from pregnant women. I made request for them at the beginning of the work, and frequently during its progress, but did not receive one. Of the females, it must be supposed that the usual number were bearing children during the appropriate age, and if there was a lack of lime-salts in their teeth it would appear in these tables. Such is not the case, *therefore the only logical conclusion is that no diminution of the density or of the percentage of lime-salts occurs in the teeth of women during the period of child-bearing on account of that fact.* The broad claim that women's teeth become soft during the period of child-bearing has been based upon the clinical observation that their teeth suffer more from caries during that period, and seems to be purely a hypothesis based on that other hypothesis that soft teeth decay more readily than hard teeth. We must find some other explanation of this clinical fact.

From the study of the density of the teeth at certain ages, it becomes evident that in any consideration of this matter, with reference to its connection with their diseases, the age must be taken into consideration. Without this we will be liable to fall into error. It also appears sufficiently plain that conclusions cannot be drawn from the examination of one or two teeth from any one individual, on account of the wide differences in the individual teeth.

### VARIATIONS IN THE SPECIFIC GRAVITY OF THE TEETH.

Turning now to the "Exhibit of Cases of Four or More Teeth from One Person," which I have arranged to show the variations in specific gravity and in the percentages of lime-salts, we will study that feature of the results. This table gives results from nineteen persons, from whom one hundred and fifty-three teeth were obtained. The ages vary from twenty to sixty,—forty years,—in which period the average gain in density is twenty-eight thousandths of a volume; the whole difference in the average for these persons is forty-three thousandths of a volume, or fifteen-thousandths in excess of that for age. In the first column to the right of the average specific gravities of the individuals, marked "Plus or Minus General Average for Age," I have placed in figures the variations of the individual above or below the general average for the particular age of each. By running along down this column it will be seen how close these averages are. The greatest variation above is twenty-thousandths of a volume, the next eighteen-thousandths, and so on down. The greatest variation below is twelve-thousandths of a volume. What these averages and the range of variation would be if we could have had all of the teeth from each individual cannot be told, but it is certain that the average specific gravities of human teeth are remarkably constant, or that personal characteristics as to density are limited to a very narrow range. In the next column, marked "Variations among the Teeth," I have set the range of variation among the teeth of each person. The range noted here must, I think, be regarded as wide, when we consider that the whole range of variation found in the teeth from one hundred and eleven persons is limited to ninety-seven thousandths of a volume. We find in case 142 (mentioned before) a variation among the teeth of sixty-five thousandths of a volume, as the widest noticed in the collection. Cases 173 and 191 each have a variation of fifty-thousandths of a volume; and so on down to a variation of but seven-thousandths of a volume in case 145. This free range of variation among the teeth of the individual tends directly to destroy the little of personal characteristics seen in the differences in the averages of the specific gravities of different persons, so that finally but little is left as to personal differences in the density of the teeth.

I have no explanation to offer for this difference in the density of the teeth of the individual. In a number of the cases the weights were taken a second and third time in search of errors, but my instruments have insisted upon the correctness of the findings. Every effort to account for it, or to connect it with other conditions, has failed me. I have tried the idea that the original development of the teeth, or the portions used, were under different conditions of personal health; but teeth that are supposed to be undergoing calcification at the same time seem as likely to show these differences as those that are calcified at earlier or later periods. The central incisors in case 142 have been mentioned as illustrating this. By taking the numbers of cases from the exhibit we have been studying and turning back to the general table of results, the individual teeth may be studied. In case 223 the upper first molars, right and left, differ eighteen-thousandths of a volume. In case 222 the upper first bicuspids, right and left, differ twenty-three thousandths of a volume. In case 217 the upper first bicuspids, right and left, differ twenty-four thousandths of a volume. In case 192 the upper cuspids differ twenty-six thousandths of a volume, etc.

In this way the reader can refer from any of the exhibits to the general table of results, and become familiar with every detail of the findings; not only of these nineteen cases, but of all of the one hundred and eleven cases.

## Percentage of Lime-Salts.

Passing now to the column of "Average Percentage of Lime-Salts" in the "Exhibit of Four or More Teeth from One Person," the reader will find these columns arranged similarly to those showing the specific gravities and their range. In examining the column of percentages of lime-salts, it should be remembered that the total range of variation in percentage of lime-salts found in one hundred and eleven persons is 4.67 per cent., and that the variation on account of age is 1.18 per cent. between twenty and sixty. It will be seen by the footings at the bottom of the exhibit that the total difference in the averages of these nineteen persons is 1.82 per cent.

In the column "Plus or Minus General Average of Lime-Salts for Age," I have given the variations of each individual above or below the general average for the particular age. In studying the figures of this column, we see that the variations in the percentage of lime-salts vary considerably from the general average for a given age, running from 1.07 per cent. above to 1.21 per cent. below, and that other percentages are scattered all the way between. Considering the fact that the total range of the percentage of lime-salts is but 4.67 per cent., this would seem to give fairly strong personal characters. But turning to the column "Variations of Lime-Salts among the Teeth,"—that is, the teeth of each person,—we find these so great as to effectually destroy the personal characteristics shown by the averages. In this column the widest variation is 2.80 per cent., which is considerably more than half the variation found in teeth from one hundred and eleven persons. The least variation in this column is 0.21 per cent., while the others are scattered all the way between. The individual teeth may be studied by taking the case numbers and referring to the "General Table of Results." For instance, in case 143 we find a difference of 0.95 per cent. between the central incisors, 0.59 per cent. difference between the cuspids, and 2.19 per cent. difference between the upper left central incisor and the upper left third molar,—the molar having the larger percentage of lime-salts. In this way the reader may familiarize himself thoroughly with all the details of these variations in the whole of the one hundred and eleven cases, and form his own conclusions. For purposes of ready reference in this work, I have given under the heading "Summary of Results" a brief statistical summary of all of the principal points developed in the investigation of the teeth. The reader should remember that these figures represent only instrumental findings, and as such they do not represent opinions. They represent facts from which opinions may be formed and conclusions drawn.

In the handling of such a mass of figures I will be fortunate indeed to have escaped all error in making up averages and tabulations, but the "General Table of Results" contains the data for the correction of all errors of that nature.

## Remarks.

Perhaps I have in this brief survey of the tables familiarized the reader sufficiently with the plan of the work to enable him to study them in detail. It will, however, require considerable study to appreciate the full bearing that the facts developed thus far have upon current opinions in dental pathology and prevailing practice in operative dentistry. If it be true that the teeth of individuals present no strong personal characters as to density and percentage of lime-salts, what must be the effect upon the present opinions as to the basis of the relative tendency to caries of the teeth of different individuals? Any basis for accounting for caries in this or that case on account of "frail teeth" or "teeth below the medium in structure," "poorly calcified teeth," etc., must disappear, whether it be in connection with the electric theory of caries, the chemical theory of caries, or the microbic theory of caries. What basis will there be for the selection and adaptation of filling-material to "soft teeth" or to poorly calcified teeth, etc.? What basis will there be for the treatment, medicinally, of pregnant women to prevent the softening of their teeth from the loss of the lime-salts that go to the building up of the bones of the child? If I have read the meaning of these figures aright, these and many other prevailing theories must give place to new ideas that will rest upon some other basis. Opinions that are prevalent must be modified or changed so as to harmonize with the new line of facts which these figures develop. These are only hints as to the bearing of this portion of the work. We may now *study* some points of its relation to the pathology of the teeth before passing to the study of the *strength of the dentine*.

## Diseases of the Peridental Membranes.

In the "Exhibit of Cases in which the Teeth were Lost on account of Disease of the Peridental Membrane," I have made a tabulation of instrumental findings for these persons. This class gives a general average specific gravity of 2.101, which is nine-thousandths in excess of the general average; and the lime-salts are proportionately increased. This fact standing alone would tend to confirm the hypothesis entertained by many that disease of the peridental membranes is especially liable to occur in those persons who have dense teeth. But at the foot of the column of ages, we find the average age of persons losing their teeth from disease of the peridental membranes to be fifty years; and that this average of 2.101 is as nearly as possible the general average for that age. The delusion is therefore dispelled. This exhibit shows the physical characters of the teeth of fifteen such persons, ranging from one to fourteen teeth each. They exhibit the usual fluctuations of density, and of lime-salts, and their average is in harmony with the general average for the time of life, neither above nor below.

The hypothesis, then, *that diseases of the peridental membranes are more liable to occur in persons who have dense teeth*, *is not maintained.* This hypothesis has grown out of the observation that these diseases are liable to attack and destroy teeth that have not suffered from caries; the supposition being that caries does not attack dense teeth.

By taking the numbers from this exhibit and following back through the general table of results, some interesting studies may be made. I may refer to case 233, giving the results in case of a woman sixty years old, who lost her teeth from phagedenic pericementitis. I obtained fourteen of her teeth, and find them to give an average specific gravity of 2.093, which is below the general average for that age; while the percentage of lime-salts is 1.21 per cent. below the average. But as there was no caries in these teeth, nor (as reported to me) in any of her teeth, they would, on the prevailing hypothesis, be classed as dense teeth. The fact is shown to be that they are soft teeth for the age; if by the term *soft* we mean low density and small percentage of lime-salts. In this way clinical observation linked with false hypotheses handed down from the past to misguide us in our interpretation of clinical appearances has been leading us astray.

## DENTAL CARIES.

As mentioned in the beginning, the study of dental caries was one of the chief objects of this investigation. That differences in density and in the amount of lime-salts in the teeth have in some way been directly the cause of the differences seen in different persons in the tendency of their teeth to decay, seems to have been a hypothesis almost universally held by dentists. One can scarcely read a page of the current dental literature in which dental caries, or current dental operations, is discussed without meeting this in some form. I was quite prepared by my feeling of uncertainty on this question to accept the verdict that the figures might give. This verdict is given in five exhibits, as follows: Exhibit of cases in which the teeth are classed as bad. Exhibit of cases in which the teeth are classed as good. Exhibit of cases in which the teeth are classed as fair. Exhibit of carious teeth individually, without reference to whether the teeth of the person were classed as bad, good, or fair; and Exhibit of teeth that were perfect in the same way. As will be seen, these classifications include all of the teeth examined; and their number is sufficient to form a fairly good basis of judgment on this subject.

In the exhibits of teeth classed as bad, good, and fair, the footings are personal; that is, whenever there is more than one tooth from one person the average for that person is represented in the footings instead of the average of the individual teeth, and of course all of the teeth from that person are included, whether carious or perfect. In the exhibit of carious teeth, and in the exhibit of perfect teeth, persons are not considered, and the footings are made from each individual tooth. Therefore some slight differences in the footings will be noted. The reason for making the last two exhibits is this: It has already been noted in the study of the general table of results that there are wide differences in the density of the individual teeth of a person, and as the general supposition is that teeth lacking in lime-salts decay more readily, it might happen that while the average for the person was up to the general average of many, the softer teeth have been those to suffer from caries. Hence these two exhibits have been arranged to test that hypothesis.

On entering the study of these tables the reader will find the number and age of each person given, and also each individual tooth, so that reference is easily made to the general table or any other of the exhibits into which the tooth might fall, for further information.

These exhibits, considered together with the exhibits with reference to age, give a strong showing as to the relation of caries to the density and percentage of lime-salts in the teeth. If the figures giving the average density and average percentage of lime-salts were taken alone, as between cases in which the teeth are classed as bad and the cases in which the teeth are classed as good, it would show those classed as bad as three-thousandths of a volume less dense. But the average age of those persons whose teeth are classed as good is 33.53 years, while the average age of those persons whose teeth are classed as bad is twenty-eight years. Reference to the classifications by ages will show the relation of these averages to the general averages for the respective ages.

But the exhibits of cases between twenty-five and thirty, and between thirty and forty, include persons of these ages only, and at a time of life when the lime-salts are not increasing ; while the exhibits of cases in which the teeth are classed as bad and as good include persons of all ages, and, therefore, those younger and those older during the time of life when the lime-salts are increasing. I will therefore make the comparison with the average increase in the percentage of lime-salts and in the specific gravity for the whole period. From the average age of eleven years to the average age of 63.60 years is 52.60 years, and the increase in the lime-salts is 2.30 per cent. This is an average increase in percentage of lime-salts for each 5.53 years, the difference in average age between those classed as bad and those classed as good, of twenty-four-hundredths of one per cent. As the difference in the percentage of lime-salts in the two classes is but twenty-hundredths of one per cent., this correction for the respective ages shows the cases classed as bad as containing four-hundredths of one per cent. the more lime-salts.

Again, if we compare the specific gravities in the same manner, it is found that the teeth classed as good have three-thousandths of a volume the greater specific gravity. But the average increase in the specific gravity is four-thousandths of a volume for each 5.53 years, which is the difference in average age. When this correction for relative age is made, the teeth classed as bad have one-thousandth of a volume the greater specific gravity. Therefore, this comparison shows a correspondence so close that it leaves practically no difference between the specific gravity or the percentage of lime-salts between the cases in which the teeth are classed as bad and the cases in which they are classed as good.

Teeth decay most in youth, before they have attained the percentage of lime-salts of adult age. Therefore, in order to know whether or not the lighter teeth decay most in early youth, I divided the cases in three sections. The first included those under twenty-five years old, the second those between twenty-five and forty, the third those over forty years old. The averages obtained in this way give practically the same results as those just given. They show no tendency of caries to attack the lighter teeth in preference to the heavier, during youth. For want of space this exhibit is omitted, the footings only being given under "Exhibit of Cases classed as Good and as Bad in Young, Middle-aged, and Old Persons."

An examination of the footings in the exhibits of perfect teeth, and of carious teeth, is also conclusive. In both of these, persons of all ages are included, also all of the teeth examined.

For all of the teeth taken together,

| | |
|---|---|
| The average age is | 32.33 years. |
| The average specific gravity is | 2.092 |
| The average percentage of lime-salts is | 63.54 |

In the exhibit of perfect teeth,

| | |
|---|---|
| The average age is | 36.26 years. |
| The average specific gravity is | 2.095 |
| The average percentage of lime-salts is | 63.59 |

In the exhibit of carious teeth,

| | |
|---|---|
| The average age is | 31.50 years. |
| The average specific gravity is | 2.091 |
| The average percentage of lime-salts is | 63.50 |

Between the perfect teeth and the carious teeth there is shown a difference of nine-hundredths of one per cent. in the percentage of lime-salts, and a difference in average age of four and seventy-six-hundredths years. If it is desired to calculate this down to the finest point, we will find the advance in the percentage of lime-salts to be two and three-tenths per cent. in fifty two years, which is sixteen-hundredths of one per cent. in four and seventy-six hundredths years. This shows that the carious teeth contain seven-hundredths of one per cent. the more lime-salts when thus corrected for their respective average of age. The specific gravity of the perfect teeth is four-thousandths of a volume the greater, but the increase for the four and seventy-six-hundredths years difference in age, is four-thousandths of a volume. These differences are too slight to be of consequence.

In order to still further test these results, the carious teeth and the perfect teeth were also divided into three sections; the first containing all below the age of twenty-five years, the second containing all between twenty-five and forty years, and the third all above forty years. These tables are omitted for want of space, but the footings are given under "Exhibit of Comparative Results from Perfect Teeth and from Carious Teeth from Young, Middle-aged, and Old Persons." From this exhibit it will be seen that in the first period the carious teeth contained sixteen-hundredths of one per cent. *more* lime-salts than the perfect teeth; in the second period the carious teeth contained sixteen-hundredths per cent. *less* lime-salts, while in the third period the carious teeth contained forty-hundredths of one per cent. *more* lime-salts than the perfect teeth. These differences are only such as would be expected from any division of the teeth into groups without reference to their liability to caries or other disease.

*These classifications, therefore, show conclusively that neither the density of the teeth nor the percentage of lime-salts they contain has anything to do with the liability of the teeth to suffer from caries.* In other words, *the teeth of persons who suffer much from caries are just as hard, just as dense, just as heavy, and contain just as much lime-salts as the teeth of persons who do not suffer from caries.* By a careful study of these exhibits in detail, it will be seen that both the denser and the less dense teeth become carious in about equal proportion.

The hypothesis that teeth that decay rapidly are soft or poorly calcified, is so interwoven with the thought of the profession and of the laity as well, that by many it will probably not be easily given up. As a general thing, a hypothesis that has been so widely held should not be given up until the most positive evidence of its fallacy has been brought forward. This evidence seems to be contained in the exhibits presented. But possibly I may be excused if I wander from the figures for a moment to examine the data upon which this hypothesis rests. I suppose most persons will say that it is founded on clinical observation. In one sense this is true, but in a broader sense it is not. I suppose all those persons who have made a special study of the adaptation of filling-materials to "soft teeth," to "frail teeth," to "teeth that especially need saving," etc., and those that have been led into that other form of study, the treatment of pregnant women to prevent the softening of their teeth during the period of gestation and lactation, and for improving the teeth of their children, causing them to take preparations of the phosphates, or to use unbolted flour, etc., in order that the lime-salts shall be increased in their teeth, believe fully that they have reliable clinical observation of soft teeth, and of hard teeth, of teeth that have become soft, and of teeth that have become hard; using these terms to convey the idea that the teeth have less, or more, lime-salts. To say that all such persons have been deceiving themselves would be saying too much. They have seen clinical appearances which they have *interpreted* as meaning soft teeth, hard teeth, teeth becoming soft, and teeth becoming hard. The actual clinical observations are: teeth firm and clear in appearance, with neat gingivæ, clean interproximate spaces, and free from caries. The interpretation is hard teeth, or teeth that are well calcified. Again the clinical appearances are, a lack of neatness of the gingivæ and interproximate spaces, teeth coated with some form of glutinous deposit perhaps, and rapidly progressive caries in numerous spots. The interpretation is soft teeth, or teeth that are poorly calcified. Still again, a young girl presents herself for examination and whatever treatment may be necessary. The festoons of the gums and the interproximate spaces are fairly neat; here and there are found a few unimportant carious spots. These are filled and the patient discharged. The interpretation is that the teeth present a fair degree of density. A few years later this patient presents herself again, after an absence that has been unduly prolonged; and it is learned that she has been married and has passed through her first period of gestation and lactation. Clinical observation discovers that the gingivæ and interproximate spaces have lost their neat appearance, the teeth have not their former cleanness and translucence, many carious cavities are found, the teeth are literally melting down. The interpretation is, that the teeth have become soft, or have lost lime-salts. Again this patient submits to treatment; the cavities are carefully filled, and the interproximate contacts that were lost carefully restored. She is again directed to the systematic care of her teeth, possibly fed upon phosphates and directed to use unbolted flour. She is aroused, and gives attention to the care of her teeth, and perhaps her general physical condition is improved. In another year she returns for examination, and the clinical observation is that the teeth are clean and firm, the gingivæ and interproximate spaces neat and clean, the fillings have stood well, and but little new decay has occurred. The interpretation is, that the teeth have become hard and dense.

When men began the study of the diseases of the teeth, caries was regarded as a disease of the tissues of the teeth in the same sense as an inflammation of the pleura is a disease of that organ ; or that a change was occurring within the tissues marked by vital changes in their elements resulting in caries of the teeth, much the same as an inflammation of the pleura may result in empyema, or in circumscribed abscess. This was most clearly taught by Fox, Bell, Koecker, Desirabode, and others from 1800 to 1840. The histological studies of John Tomes and others from 1840 to 1860, from which we have derived most of our information of the structure of the dentine, showed that such pathological changes could not occur in the tissues of the teeth, and the interpretation of inflammatory changes in the dental tissues was gradually abandoned. The idea of simple solution of the lime-salts by acids, following some undefined kind of irritation and change of tooth-structure, the chemico-vital theory, as it was called, was substituted. This idea seems to have prevailed in spite of the studies of Robertson (1835) and Regnard (1838), and others of their time, and of Magitot, Watt, and others of a later time, who held to the simple chemical theory. As the lime-salts were found to be the first or principal portion of the tooth attacked, the question of the density of the teeth as the controlling factor rendering the teeth of persons more or less liable to decay seems to have gradually taken hold of the minds of men without having been especially advocated by any one of the prominent writers. It has in this way taken the place of the idea of inflammatory changes, and that other undefined something that constituted the second element in the chemico-vital theory. Gradually this has assumed the form of vital changes in the amount of lime-salts contained in the teeth.

I think it will be seen that this has always been an interpretation, not an observed fact. The influence of this interpretation upon clinical observation has been such that in the recital the interpretation has taken the place of the observed facts to such an extent that with many in the profession the observation of a large amount of carious material, or large numbers of cavities, has led to the expression "soft teeth," "teeth poorly calcified," etc.

The greatest good that I could expect to come from this laborious investigation (except as it may affect future studies of caries of the teeth) would be the general abandonment of the idea that the teeth of any patient are so lacking in density as to interfere with reasonable filling-operations, with any of the materials now in use. This will be discussed further in connection with the examination of the strength of the teeth. It must, of course, be understood that there may be, and often are, reasons for not immediately using metals in this or that case. The teeth may be hypersensitive, a child may be too young to bear such operations, *but the reason for deferring them is not to be found in softness of the teeth.*

## The Effect Produced by Drying Dentine.

Before considering the strength of dentine I wish to notice the effects produced by drying, or the more or less complete removal of the free water. It has generally been noted by those who have had occasion to handle dried teeth that they become very brittle. This has been a great drawback to those who have been teaching operative technic classes, and all of those who have endeavored to illustrate plans of operating upon teeth out of the mouth. Much of the material which I collected for the purpose of studying the strength of the dentine was lost by being allowed to become over-dry. This led me to make some study of the effects of the removal of water. In endeavoring to cut blocks from dry teeth, it was found that while some of the slabs would fall to pieces in the cutting, portions of the same slabs that hung together seemed to possess the full strength of the dentine. An examination, with a low power of the microscope, of the cut surface of molars that had been sawed across the crown, revealed the fact that they were literally full of checks. These checks, or cracks, ran in any and every direction without apparent order of arrangement, and were very irregular in their distribution. This was confined almost entirely to the crowns of the teeth, the cracks not appearing in the roots or at most but rarely. These cracks seemed to be a result of shrinkage.

A number of bars eight-hundredths of an inch square were cut from the crowns of fresh molar teeth. The length varied from twenty to thirty-four-hundredths of an inch. These, after being carefully measured with the micrometer, were subjected to a temperature of 200° F. for twelve hours and again measured. The result is made out in tabulated form, thus :

| No. | Age. | Tooth. | Percentage of Shrinkage. |
|---|---|---|---|
| 1 | 30 | Lower 1st molar | 1.61 |
| 2 | 30 | Upper 1st molar | 1.91 |
| 3 | 28 | Upper 3d molar | 1.81 |
| 4 | 50 | Lower 1st molar | 1.62 |
| 5 | 18 | Upper 1st molar | 1.53 |
| 6 | 18 | Lower 1st molar | 1.52 |
| 7 | 30 | Upper 2d molar | 1.80 |
| 8 | 30 | Upper 1st molar | 2.27 |
| 9 | 12 | Lower 1st molar | 2.04 |
| 10 | 12 | Lower 1st molar | 2.00 |
|  |  | Average | 1.81 |

These results exhibit considerable variation. There have not been a sufficient number of teeth used in this experiment to determine the conditions under which shrinkage will be great or slight, but it is sufficient to show the cause of the checking of the dentine of the crowns of the teeth in drying. The enamel is almost incompressible, or has but slight elasticity as compared with dentine. When the dentine shrinks in drying its circumference is rigidly held by the enamel, and the result is that the dentine parts from the enamel over a considerable area, or the dentine is checked, or both may occur. The effect on incisors and bicuspids is often very curious. In a large number of instances these teeth will split lengthwise of their crowns, and if the root has previously been cut away, will fly asunder with considerable force. It often happens, however, that the enamel parts from the dentine over a considerable space instead of the teeth splitting. In the molars the most usual effect of drying is seen in the innumerable checks mentioned above. This breakage has been so prominent in the teeth I have handled recently as to give me the impression that with pulpless teeth in the mouth there is serious danger of injury by some of the processes of hot-air drying. In teeth with living pulps one could not expect that the drying would be of sufficient depth to endanger the tooth by checking, but pulpless teeth part with their water very readily, and the danger is correspondingly increased.

If those who need teeth for the purpose of demonstrating the various dental operations could manage to have them placed in a solution of creasote, 1 : 400, or similar disinfectant, and allow them to remain submerged until wanted for use, they would probably find them available for any length of time. At least that would seem to be the case from experiments that have thus far been made. To keep these teeth successfully, two things must be accomplished. Drying and decomposition must be prevented. Experiments as to the results of decomposition on the strength of the dentine have not yet been carried far enough to be conclusive, but it seems probable that decomposition has an effect upon the organic matrix that very seriously impairs the strength of the dentine. This probably accounts for the loss of strength in pulpless teeth, as shown by breakage at low stress.

FIG. 2. THE MACHINE FOR CUTTING BLOCKS OF DENTINE.

(Reduced one and one-fourth diameters.)

This is constructed on the general plan of lathes for turning metals, the pair of disks (*A*) by which the cutting is done being supported upon a mandrel held between centers. The table upon which the tooth (*B*) to be cut is held is made of steel, and is provided with fixtures by which the tooth is made secure in the desired position. The table is moved upon the disks by the screw-handle *E*. The screw-handle *F* moves the table to bring the tooth in position to be moved upon the disks. This latter is graduated at *G*, so that the movements of the table in this direction may be measured to within a fraction of one-thousandth of an inch for the purpose of cutting slabs of any desired thickness with a single disk. The whole machine is built heavy and strong, so that it may do its work very accurately.

## THE STRENGTH OF DENTINE.

I have made such tests as I was able to devise of the strength of dentine blocks of known density, so that comparisons could be made. I may say now, however, that this has been a difficult portion of the work, and though unsatisfactory in the scientific sense, it has shown that the teeth are abundantly strong to support fillings which will withstand the force of mastication, and is highly encouraging to the future of dental operations.

The tests were made to determine the strength of the dentine.

For this purpose a machine was devised and built for cutting blocks of dentine of definite size and form. It consisted of a steel table supported on an apparatus worked by screws, similar to the ordinary slide rest that carries the tool for turning metals in the turning lathe. (See Fig. 2.) On the table fixtures were arranged to hold a tooth, or any portion of it, in the desired position for cutting. The cutting was done by disks fixed on a mandrel carried on centers in the lathe, so that they should work as steadily as they could be made to do. The disks gave me much trouble, but finally, through the kindness of The S. S. White Dental Mfg. Co., two copper disks, two inches in diameter, coated with diamond dust, were made especially for this work. These were mounted with heavy brass collars one inch in diameter to keep them from wavering ; were set side by side the right distance apart to cut two sides of a block of the dimensions required,

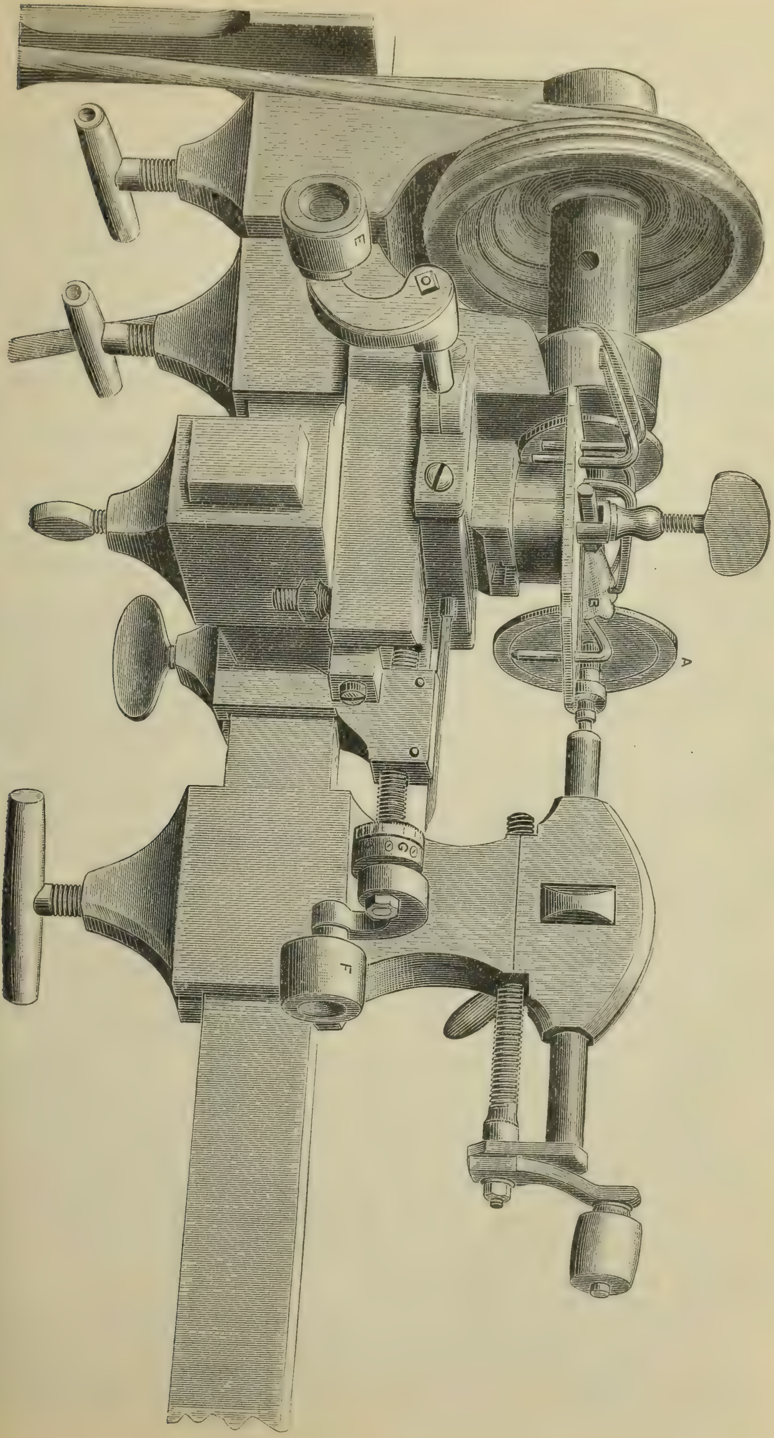


Fig. 2.

so that each dimension of the cube finally obtained for test was made by passing between these disks, thus insuring the greatest possible degree of accuracy of size and form. Besides this, the machine was arranged for very delicate measurements of the movements of the table for various work with a single disk.

The form and size chosen was the cube, eight-hundredths of an inch square. This I found to be the largest size that I could generally get from the crown of a molar or bicuspid without including enamel, or having imperfections on account of the horns of the pulp-chamber. It was regarded as important to make these blocks as large as could be obtained with a fair degree of regularity, in order that unavoidable variations in size should be of the least consequence. The variation from the size determined upon was but little more than one-thousandth of an inch. To many dentists, measurements in hundredths and thousandths of an inch, which I shall be obliged to use, or resort to similar decimals of the meter, may be difficult to follow, as the more common English measurements are in vulgar fractions, as eighths, sixteenths, thirty-seconds, etc., and a word of explanation may be of assistance. An eighth of an inch is one hundred and twenty-five-thousandths of an inch, or twelve and a half hundredths. A sixteenth of an inch is sixty-two and a half thousandths, or six and a quarter hundredths. These blocks are then one and three-quarter-hundredths larger than one-sixteenth inch square.

For trial of the strength of these blocks I have used a dynamometer constructed for another purpose by Tiemann & Co., of New York, which I have adapted to this work. It consists of a steel spring in the form of a double bow, which, when compressed, exerts a stress or force of three hundred and fifty pounds avoirdupois. It is provided with cog-work and a dial for the registry of any number of pounds within that compass. This has been arranged so that the spring is compressed with a screw, and the stress exerted by the spring is applied through a steel rod acting upon a fixed support. The block of dentine, the strength of which is to be tested, is placed between the end of this steel rod and the support, so as to receive the stress exerted. (See Figs. 3 and 4.)

Almost immediately after beginning the use of this instrument, it was noticed that dentine blocks were considerably compressed before they crushed, or that they exhibited considerable elasticity. It was thought desirable that this be measured, and a suitable form of meter was devised. At first this was a simple lever with a cam acted upon by a spud fixed in the steel rod by which the stress was delivered, and which had a dial plate upon which were registered hundredths of the thickness of the blocks tested. Afterward, however, this was changed for a regular micrometer acted upon in the same way, and which could be used for delicate measurements independently of the use of the dynamometer. This micrometer registers thousandths of an inch, and one-fifth of that is easily recognized. With it, therefore, the least strain, springing, or compression of the block being subjected to stress is registered.

The devising and construction of this delicate apparatus required much time and expense. In the mean time, the work already detailed was progressing, and the crowns of teeth thought suitable were laid aside to await its completion. But not knowing the conditions required in such work, I found, to my chagrin, that the material had been ruined by being allowed to become over-dry, and this work was therefore limited to material coming to hand later. On this account I have not made so many of these tests as I had wished. And I especially regret that after this work was begun I received but few pulpless teeth that had become discolored, for the trials that I had opportunity to make of such teeth have shown a notable loss of strength. This has been, in some degree, supplemented since by the use of teeth not weighed.

Before entering further into the consideration of this subject, I should explain the use I shall make of the words *stress* and *strain*. For the want of better, and to avoid confusion, I shall use these words in the technical sense in which they are employed by civil engineers. In this use the word *stress* always refers to pressure applied, as, the stress was fifty pounds. The word *strain* always represents the effect produced in the way of change of form, or movement of the material to which the stress is applied, as, the filling was strained from its margins by the stress of mastication.

The exhibit of the strength of dentine includes trials of seventy teeth, of which the specific gravity of all, and the percentage of lime-salts in nearly all, were known. The exhibit shows the strain, or elasticity, of blocks eight-hundredths of an inch square at one hundred pounds, and at one hundred and fifty pounds' stress, and the number of pounds' stress at which each block crushed. Also the number of the case, the age of the person, the particular tooth, whether carious or perfect; the condition of the pulp, whether alive or dead, is also given. The reader may refer to the general table of results for further information.

It appears from this exhibit that the average stress required to crush blocks of human dentine eight-hundredths of an inch square is two hundred and thirty-eight pounds. Also that such a block is strained or compressed two and nine-hundredths per cent. (2.09%) of its thickness by a stress of one hundred pounds, while with one hundred and fifty pounds it is compressed four and three-hundredths per cent. (4.03%) of its thickness. In marking these strains of blocks, the beginning was taken after twenty-five pounds' stress had been applied, so that the difference is really between seventy-five pounds and fifty additional pounds. This ratio was fairly maintained as the pressure was increased, until the crushing stress was nearly reached and the block had begun to fail. The reason for making twenty-five pounds the starting point was that the compression below that stress seemed very irregular and uncertain, which was thought to be partly because of imperfect fitting of the surfaces of the blocks to the surfaces of the steel, partly on account of dust from the disks, which it was found difficult to completely remove.

When a stress of one hundred to one hundred and fifty pounds on blocks of the size mentioned from living teeth is removed, there is perfect recovery of form, the block resuming its original measurement. This represents the elasticity of the dentine. The dentine is uninjured. It may be compressed by a stress of one hundred and fifty pounds time and again, and recover perfectly. It is this elasticity that makes billiard balls of ivory so valuable. If, however, the dentine is compressed to very near its crushing point, permanent injury

FIG. 3.

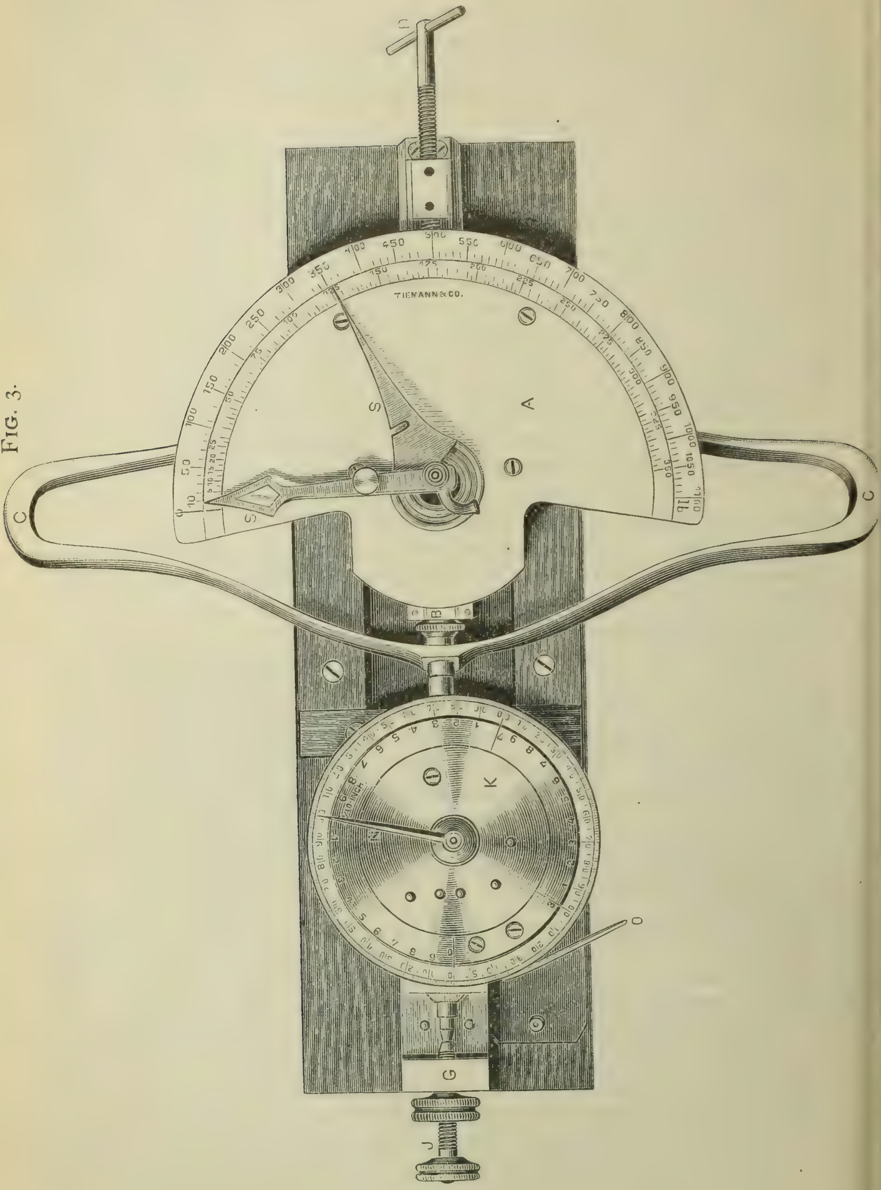
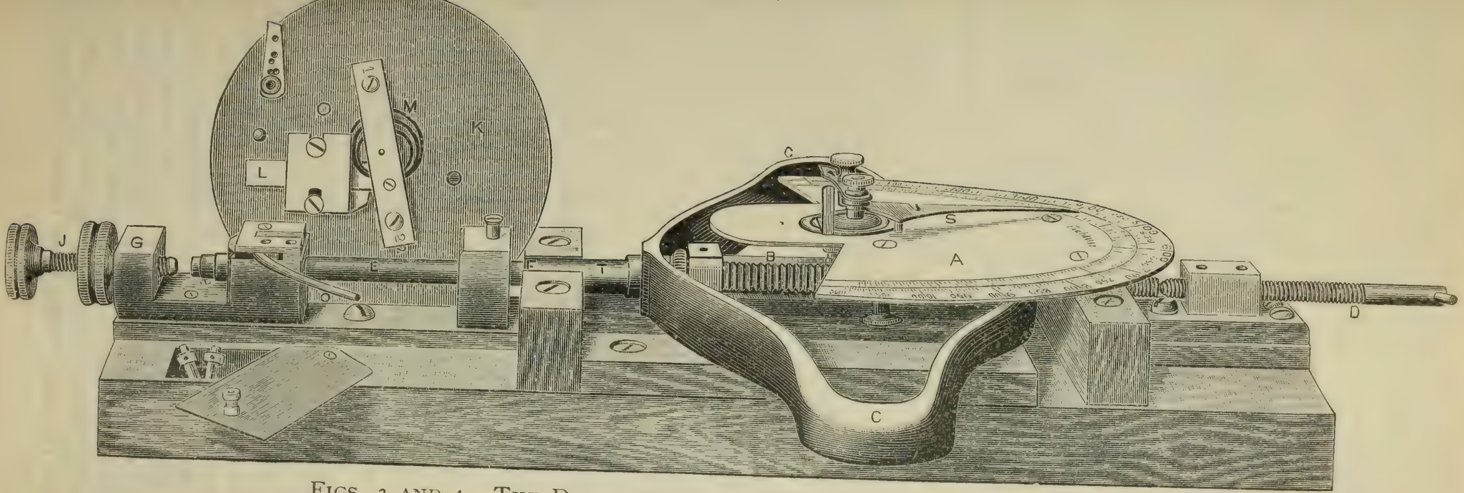


FIG. 4.



FIGS. 3 AND 4. THE DYNAMOMETER WITH ITS MICROMETER ATTACHMENT.

(Reduced one and one-fourth diameters.)

Fig. 3 shows the instrument in position for use. Fig. 4 shows the instrument with the micrometer disk (*K*) removed and turned up to show its lower side, and the rod *E*, by which stress is conveyed from the dynamometer. *A* is the disk and register of the dynamometer, which consists of a stout steel spring (*C C*) provided with pinion-wheel and cog-bar (*B B*) which move the index fingers (*S S*) which register the number of pounds' stress induced by compressing the spring by the screw *D*. The rod (*T*, Fig. 4), attached to the spring of the dynamometer, impinges upon rod (*E*), belonging to the micrometer, at *F*, but is not attached, so that in using the micrometer alone the screw *D* is loosened and the dynamometer slides back out of the way. A solid block of metal (*G*) is secured firmly to a bar of steel, all of which is fastened to a heavy base of wood. This block has a gap cut through its upper portion in which the rod *E* meets the support (*F*) between which objects to be measured, or the strength and compressibility of which are to be tested, are placed. The disk (*K*) of the micrometer is provided with pinion-wheels and cog-bar (*L*, Fig. 4). This cog-bar when in position is held forward against a lug in the rod *E* by the coiled spring *M*, Fig. 4, which also controls the index finger *N*, Fig. 3, so that any forward movement of the rod *E* is registered upon the micrometer disk (*K*) in graduations of thousandths of an inch. *O O* is a lever for pressing back the rod *E* for placing an object in the grasp of the instrument, to be measured, or tested as to strength. It will be seen that in testing the strength of an object, if it yields or is compressed as the pressure is applied, by turning up the screw *D*, such compression will be accurately registered by the index finger (*N*) of the micrometer, while at the same time the number of pounds' stress will be registered by the index fingers *S S* of the dynamometer. The second index finger of the dynamometer is not attached to the pinion, but is carried around by the first, and in case of a crush it is left, while the first is carried back by its coiled spring. In this way the second finger is always left to indicate the highest stress applied.

results, and it fails to return to its original form. This point was difficult to note with accuracy, and was not tabulated because it seemed impracticable to arrive at it with sufficient precision. This varied considerably in different teeth; those presenting a bright translucence, and especially those presenting a marked opalescence of the freshly-cut surfaces, returned to their normal form after the highest stresses, *i.e.* the stress nearest the crushing stress. This superior elasticity did not depend directly on the percentage of lime-salts, nor upon the density, yet on the whole those teeth that had *the least lime-salts* presented the greatest power of return to the normal after compression. The tusk of the elephant, from the few examinations that I have been able to make, appears to have about sixteen and forty-two one-hundredths per cent. less lime-salts than human dentine, and its elasticity is much greater. In this case the constituents seem to be proportioned for the purpose of resistance to a breaking stress, while the crowns of the human teeth are formed for the purpose of resisting crushing stresses and abrasion. What relation this elasticity of human dentine may have to some classes of failure of fillings has never been considered. It is not impossible that it may be of considerable importance.

A study of the exhibit of crushing stresses will show that the variations of the strength of the human dentine are not directly dependent on the density, nor on the percentage of lime-salts. The strength seems rather to be dependent on *the condition of the organic matrix*, though of this I could gain no clear intelligence. Maceration for six weeks in a mild solution of creasote, just enough to prevent decomposition, did not impair the strength. Maceration in water at 98° F. for six weeks in the presence of a very slight growth of one of the film-forming cocci, the water remaining neutral, did not impair the strength. Two efforts to produce decomposition by simply placing freshly-extracted teeth in distilled water failed, though earlier in the work decomposition occurred generally in tubes containing teeth not sterilized. Still, what evidence I have been able thus far to obtain points to decomposition as the cause of the deterioration of the strength of pulpless teeth. The strength of living teeth fluctuates considerably in different persons, ranging all the way from two to three hundred pounds for blocks eight-hundredths of an inch square. I have been unable to account for this wide fluctuation. Even blocks from the same tooth cut side by side show considerable fluctuation, though in a good many cases blocks from the same tooth will all crush within a few pounds of the same stress. I have tried to account for this through faults in the preparation of the blocks; surfaces not parallel, unevenness in size, etc., but that has not seemed sufficient. It may have been in a measure due to the partial drying of the teeth between the time of extraction and the time I received them, though everything possible was done to avoid this source of error. Another source of error difficult to guard against was found in the manipulation of the dynamometer. According to a law of the fatigue of materials, which was found to apply with much force to dentine, a material, such as the harder metals particularly, may stand a great stress for a time, but if it is maintained, will, after a time, collapse more or less suddenly. Dentine was found so sensitive to time in its endurance of heavy stress that it was difficult to turn on the pressure with such regularity that differences in time would not materially affect the number of pounds shown at the moment of crushing. For instance, a block that would crush at two hundred and twenty-five pounds if left to stand ten seconds, might easily be run up to two hundred and fifty pounds by pushing the screw vigorously. Indeed, it was found that dentine was so sensitive to time in its endurance of great stress as to constantly menace accuracy of results. However, this only affected a small range near the crushing point. A block might be allowed to stand indefinitely within about fifty pounds of its crushing point without danger of injury ; but if the stress was within, say, twenty-five pounds of the crushing point, it would generally collapse suddenly after standing anywhere from ten seconds to half an hour.

A certain degree of fluctuation constantly shown by the best blocks from each tooth seemed to have close connection with the color of the dentine ; or perhaps the term, brightness of the cut surfaces expresses it better. Dentine that, when cut into slabs, showed a clear translucence, and especially that showing a marked opalescence when turned about in a bright light, could always be depended upon to show a high crushing stress, no matter whether its density and percentage of lime-salts was high or low. On the other hand, dentine that under like conditions showed an opaque appearance and a dead color would break with a correspondingly slight stress. This was found to be a better indication of the strength of a tooth than a knowledge of its density and percentage of lime-salts. *The presence or absence of caries was of no consequence whatever*, the block being cut, of course, from the sound portion of the tooth.

The question of age has some importance in its relation to the strength of dentine, *and this relation is the reverse of the relation of density to age*. Nearly all of the high crushing stresses will be found in comparatively young people. This was much more strongly impressed on my mind during the progress of the work than the figures of the exhibit will justify. Perhaps this was partly because I was surprised to find the teeth of young persons as strong as those of middle age and beyond. Still, I feel convinced that if I could have tried the crushing stress of all, or nearly all of the bicuspids and molars, they would have shown a very regular gradation, increasing up to about twenty-five years and diminishing in strength from about thirty years on to old age. It will be noticed that case 233, age sixty, presents a number of strong teeth. These were unusually bright for the age, and they increase the percentage. This with cases 234 and 195 must, I think, be rather unusual, and in a larger collection would probably be lost in their influence on the percentage. There is a close relation of brightness of cut surfaces to resistance which does not necessarily relate to the color of the enamel as the teeth stand in the mouth, but *the popular notion that white teeth are soft teeth is found to be an error*. Take case 205, which gave a crushing stress of three hundred pounds for the living tooth, which was deeply decayed, and two hundred and sixty pounds for the tooth with pulp dead. The living tooth was very white, and the cut surfaces gave a brilliant opalescent play of color which could not fail to attract attention. The other, while not giving the brilliant opalescence, was a white tooth. Also case 210 was notable for the brilliancy of its cut surfaces. It will be noted that the teeth giving these remarkably high crushing stresses are of low density, with the exception of case 234, which crushed at two hundred and ninety pounds, and had a remarkably high density and high percentage of lime-salts. It will be noted also that teeth of high density that also show high crushing stresses have a relatively high percentage of organic matter as well, maintaining the idea that strength is dependent in a very large degree upon the organic matrix. It seems that some importance may attach to the co-relation of the organic matrix and lime-salts, a matter that I have not had the time to follow out in detail, so as to understand its meaning.

Case 226, which has no parallel in all of the collection, and therefore must be regarded as abnormal, shows the most remarkable percentage of lime-salts, and though the pulp was still alive in the root-canals at the time of extraction, it crushed at one hundred and eighty-five pounds, and gave the remarkable compression of eight per cent. at one hundred pounds and twelve per cent. at one hundred and fifty pounds. In this case all of the unusually large pulp-chamber was filled with a clear calcification, which was perfectly adherent to the walls of the chamber and was weighed and calcined with the section. This is probably the direct cause of the abnormal percentage of lime-salts. This calcification had long ago cut off the nutrition of the coronal portion of the dentine. The occlusal portion of the crown was worn by mastication until the fluids of the mouth had access to the dentine. For these reasons the dentine was of a muddy or very dull color, and acted under pressure somewhat like pulpless teeth that have become discolored.

During the progress of the work many things were noted that could not well be tabulated, and some of these were taken up and studied later. For example, a number of teeth with calcified pulps and crowns somewhat worn were examined. These gave almost constantly low crushing stresses, the majority breaking at about two hundred pounds. (See case 233.) It seemed clear after hunting out and testing other cases that there was a distinct deterioration with advancing age, as the teeth from the older persons generally broke with the lighter pressure. This seems to be contrary to the general thought of the profession, most persons seeming to regard such teeth as very strong. Yet I think those of long practical experience will be able to recall many instances of breakage of walls in cases where they have built up occlusal surfaces to provide against wear. The operator will do well, therefore, to consider these, next to discolored pulpless teeth, the weakest with which he has to deal, and see to it accordingly that he has strong walls and firm anchorage. Also the enamel of these teeth seems disposed to flake away from the dentine as though something had happened to the junction of the two tissues.

## Pulpless Teeth.

Pulpless teeth seem to lose strength if they remain long with open pulp-chambers. My effort to study this condition was almost fruitless, however, from my inability to obtain pulpless teeth with a history. I made diligent effort to obtain them, but failed. The majority of pulpless teeth coming into my hands were of fairly bright color, indicating that the pulp was recently dead. These presented no especial differences in physical characters from those with the pulp-tissue intact. But those muddy in color, especially if markedly discolored, showed constantly an additional percentage of water; and the few of which I had the opportunity to test the crushing stress, broke below two hundred pounds, showing a marked loss of strength. This happens in the teeth of young people, and in those of middle age; but whether it is generally greater in the teeth of the young, as seems to be the prevailing opinion, I had not sufficient material to determine.

Since the tabulation was completed I have tested the strength of fifteen discolored teeth from persons from twenty-five to fifty years old, all of which have broken at stresses between one hundred and fifty and two hundred pounds.

I have made diligent search to find whether or not teeth from which the pulp had been removed, and the canals and pulp-chamber filled without admitting the fluids of the mouth, were subject to a similar deterioration of strength. It is now well known that teeth treated in this way retain their color almost perfectly; and from my observation of the relation of color to the strength of the teeth I am prepared to entertain the supposition that they retain their strength also. Only one tooth came into my hands with a root-filling. It was a central incisor, and had not sufficient tissue for me to obtain a block; but it showed no undue percentage of water, and the color was good. Up to the present time I have been unable to obtain the history of the filling of this root. It belongs to case 233.

## Strength of Slabs and Thick Pieces of Dentine.

The exhibit of crushing stresses thus far discussed is for naked blocks eight-hundredths of an inch square; that is, these blocks had no lateral support whatever. An effort was made to determine the influence of lateral support. For this purpose slabs, or sections, eight-hundredths of an inch thick were cut across the crowns of molar teeth, and one margin of this slab cut away perpendicular to its thickness, a little more than the thickness of the enamel leaving a free margin of dentine. A steel point eight-hundredths of an inch square was placed upon the dentine slab with one of its square sides parallel with and even with this free margin, and stress applied. This gave the square of dentine receiving pressure the lateral support of continuous dentine on three sides. Very few of these sections broke with a stress of three hundred and fifty pounds; the full capacity of my instrument. Some that failed to break at once would break suddenly after sustaining this stress for a few minutes, others after a half-hour, more or less, while some were capable of sustaining it indefinitely without injury; and after removing them from the instrument no mark or sign whatever was left to show where the steel point had been placed. Thicker sections were tried, but they were generally uninjured by a stress of three hundred and fifty pounds. So few of these pieces of dentine crushed that a tabulation would be of no value. The compression or elasticity shown was usually from five to seven per cent.; occasionally as much as eight per cent. of the thickness. In pieces that did not crush after standing some time, there was perfect return to the normal dimensions after removing the stress, and no mark of the steel point was left to show where it had been placed. In comparison with the best of granite, dentine is more than one-third the stronger.

That dentine will generally sustain this stress is certainly sufficient for us as dentists to give full confidence in its sustaining power to meet all our needs in filling teeth. The weakest of them have ample strength, and to spare, so far as direct crushing stress is concerned. Our fillings are supported, not by naked blocks of dentine, nor yet by sections of dentine, but in cavities within the dentine where the sustaining power is in every way stronger than in any of the trials related.

## Strength of the Enamel.

The enamel of the teeth shows less strength than the dentine. Indeed, taken alone it will sustain but little stress. I have made many efforts to obtain the strength of blocks eight-hundredths of an inch square, and four-hundredths thick (8 x 8 x 4), cut from the enamel of various teeth. No matter how these were cut (as to direction of the enamel-rods) or how the stress was applied, the crystals, or enamel-rods, would begin to split off with very light stress comparatively, and the whole block would collapse at from thirty to seventy-five pounds. The results were so extremely irregular that a tabulation would give no correct view of it. In all such experiments with enamel there is much difficulty in fitting the steel to the cut surface of the enamel so perfectly that the bearing will be exact on every part, and the enamel is so unyielding that the parts receiving the pressure immediately snap.

Trial of the enamel in position gave much better results than the blocks, though the same difficulties of fitting of surfaces was met with, or at least I so interpret it. For these trials the crowns of the teeth were cut away from the roots at the gingival line, in order to obtain a perfectly flat surface for the support of the crown, and then the occlusal face was cut away to various depths. The piece thus obtained was placed in the dynamometer with the squared end of a steel point eight-hundredths of an inch square placed on the enamel, one of its sides even with the margin of the enamel, and the stress applied vertically, or parallel with the long axis of the tooth. Stress applied in this way was generally borne without injury up to one hundred pounds ; but when increased much beyond that point the enamel usually began to chip away, the superficial portions usually breaking first, and the deeper portions later as the stress was increased. The stress at which this chipping began varied from one hundred pounds, or a little less in some instances, to one hundred and fifty pounds ; and rarely one hundred and seventy-five pounds would be borne. Pulpless teeth that had become somewhat discolored did not bear so much stress applied in this way, but usually began chipping, or often the enamel split bodily away from the dentine at from fifty or sixty to one hundred pounds. The parting of the enamel from the dentine seems to be peculiar to pulpless teeth, and to those in which the pulp has been long calcified so as to cut off the nutrition of the dentine.

The difference seen when a cushion of soft gold (as pure gold plate) was placed between the steel point and the enamel was quite remarkable. When cushioned with two thicknesses of No. 28 pure gold plate, the enamel of living teeth would generally bear two hundred pounds' pressure before chipping began. This is in part explained by the fact that the gold would yield sufficiently to make the pressure practically equal over the whole surface pressed upon, partly by the increase of the area by the spreading of the gold, and partly by the fact that in this case the dentine coming under the point was made to bear its part of the load; which it did not without the cushion, because of its elasticity allowing it to yield so as to throw the burden on the enamel. In case the cushion of gold was made considerably thicker, no fracture of the enamel would occur with any pressure that my instrument would exert.

In comparing the crushing stresses of the teeth with their tendency to caries, *the result seems to be that no relation whatever exists.* Teeth classed as *bad* seem as likely to be strong teeth as those classed as *good.* Some of the strongest specimens of dentine have been taken from teeth that were deeply decayed. One case that came into my hands just after I had completed the regular order of work was quite remarkable for the strength of the teeth, as nine blocks cut from five badly carious molars averaged within a fraction of three hundred pounds. This patient was a girl of Irish parentage, dark hair, moderately good health, but by no means robust, and twenty-one years old. She consulted me about the condition of her teeth. She had had considerable filling done to no purpose. There was no tooth in the mouth without cavities except two of the lower incisors. The crowns of all of the bicuspids, upper and lower, were broken away, together with half of those of the molars and two of the upper incisors. Indeed, the denture was a perfect wreck from caries in spite of the efforts that had been made in the way of filling, which seemed to have been fairly liberal in quantity if not of the best in quality. Yet these were the strongest teeth that came into my hands.

## CONCLUSIONS.

From the facts developed in this investigation, it seems that the following conclusions may be summarized.

The teeth are strongest in youth and early adult age, diminishing somewhat in strength with advancing age.

Teeth that have lost their pulps and have become discolored lose strength in a marked degree, apparently from a deterioration of the organic matrix.

Teeth that have become badly worn from mastication, and in which the pulps become so much calcified as to cut off the nutrition of the crown portions of the dentine, lose strength, apparently from deterioration of the organic matrix.

Teeth of old people, and especially those in which much calcification of the pulps occurs, deteriorate in strength.

There is no basis for the supposition that the teeth of children under the age of twelve years are *too soft to receive metallic fillings.*

Differences in density or in the percentage of lime-salts in the teeth is not the controlling factor in the strength of the teeth, nor their hardness, this seeming to depend upon the condition of the organic matrix.

Differences in the strength of the teeth have no influence as to their liability to caries. Differences in the density, or in the percentage of lime-salts in the teeth, have no influence as to their liability to caries.

The active cause of caries is a thing apart from the teeth themselves acting upon them from without, and, from a consideration of the facts thus far developed, the logical inference is, that the cause of the differences in the liability of individuals to caries of the teeth is something in the constitution, operating through the oral fluids, and acting upon the active cause of caries, hindering, or intensifying, its effects.

Caries of the teeth is not dependent upon any condition of the tissues of the teeth, but on conditions of their environment.

Imperfections of the teeth, such as pits, fissures, rough or uneven surfaces, and bad forms of interproximate contact, are causes of caries *only in the sense of giving opportunity for the action of the causes that induce caries*.

The objects to be attained in filling teeth are the perfect exclusion of the causes of caries from the tissues by sealing the cavity, *and securing such form as will prevent lodgments of débris about the margins of the filling*, and thus prevent the further action of the cause of caries.

There is no basis for the supposition that some teeth are too soft, or too poorly calcified, to bear filling with gold, or other metal in use for that purpose, since all are found to be abundantly strong.

There is no basis for the selection and adaptation of filling-materials to soft teeth, hard teeth, frail teeth (in structure), or poorly-calcified teeth. What basis there may be in the *conditions surrounding the teeth* for the selection and adaptation of filling-materials must be left to future developments to discover.

With our present knowledge, the only basis for the selection and adaptation of filling-materials to classes of cases is the individual operator's judgment as to which he can so manipulate as *to make the most perfect filling*, considering the circumstances, his own skill, and the durability of materials.

There is no basis for the supposition that calcic inflammation of the peridental membranes or phagedenic pericementitis (so-called pyorrhea) attacks persons who have dense teeth in preference to those whose teeth are less dense.

There is no basis for the treatment of pregnant women medicinally with the view of furnishing lime-salts to prevent the softening of their teeth, or with the view of producing better calcified teeth in their offspring.

## Theories of the Cause of Caries.

The exciting cause of caries is now well known to be certain classes of micro-organisms. This has been investigated and explained by Dr. Miller, of Berlin, and his findings have been sufficiently verified. At the present time there are perhaps few persons who question the correctness of this view. It may be stated briefly that certain of the micro-organisms that habitually grow in the oral fluids find lodgment in fissures, grooves, and other irregularities in the surfaces of the teeth and upon surfaces not cleaned by the friction of mastication, such as the proximate surfaces, buccal surfaces, etc., and continuing their growth in these positions for weeks and months, together pro-by means of a fusible plug. A small pellet of the same body or gum as that used in the case is placed between two platinum terminals of a circuit. This is placed in the oven, and the upper terminal being weighted, when the porcelain fuses it sinks down, coming in contact with the lower, which immediately closes the circuit operating a magnetic cut-off for the muffle.

I have found in actual practice that these two instruments, while giving results much more uniform than by the old method, are still liable to variations. The current may vary when the time cut-off is used, or the porcelain fuses may be of different densities. I have therefore devised a third form of cut-off upon a different plan, which varies with the current. It was found that the hotter the platinum wire becomes, the greater becomes its resistance to the flow of current. The result is that when the button is reached, upon which the porcelain fuses, the quantity of current is greatest at first, but gradually decreases. As the muffle becomes hotter the resistance of the wire increases, and there is actually less current flowing when the muffle is hottest. We take advantage of this fact, and somewhere in the circuit we arrange the wire in the form of a small hollow coil. This will develop magnetism in a piece of soft iron which is allowed to swing in or out of the coil. As the current increases, the iron will be drawn in the coil, and as the current decreases gravity draws it out. The various movements of this are in exact proportion to the current or heat developed. The voltage of the current may vary, but the heat in the muffle and the swing of this soft iron core are always alike. So we may arrange a scale upon the instrument which tells us as accurately the temperature in the muffle as does a thermometer that of your office. At any desired point on this scale we may place a movable contact point, which the hand will touch as it drops back. The connection thus made may operate the cut-off like the fusible button on an electric bell.

But all these complicated adjuncts are unnecessary. The operator can, with a little experience in observing the fusing process, cut the current off at the exact time, for the eye is within a few inches of the case, and he can see the different particles coalesce. It is my custom to gradually raise the heat by the hand lever every few minutes till next to the last button is reached. On this one the case will be just ready to fuse, and when I have a moment's time put on the last button and fuse.

The cost of operating the electric oven may be a greater surprise than the oven itself. On first thought one would suppose that the cost would be greater than any other form: but when we consider that in this instance, and differing from all other appliances for this purpose, the heat is generated on the inside of the oven instead of the outside; that the whole amount of heat, instead of being applied from without and heating all surrounding objects, is generated at the point where used, and confined within a space of less than ten cubic inches; so concentrated is this heat that the oven may be held in the hand while at its highest heat. Herein lies the economy. By all the old methods the heat is applied from without, so that by the time the fusing point is reached within the muffle, enough heat is wasted through the chimney or by radiation, which if it had been concentrated to ten cubic inches would have done the work a great many an impossibility to produce what is known as "gassing." Instead of removing the case from the heat and subjecting it to a sudden change of temperature, the case remains quiet and the heat is removed from the case, allowing it to cool without subjecting it to a sudden change of temperature.

With this instrument, any degree of heat up to the melting point of platinum is possible. The accuracy with which the varying degrees of heat may be obtained, and the perfect control over the instrument, open new possibilities in prosthetic dentistry. The heat required for fusing porcelain is so high that heretofore it has been more or less a matter of guess-work to all except to him who makes this work a specialty, and even then the old method is so beset with exacting conditions for good results that even the specialist opens the muffle in an anxious frame of mind.

With electrical heat we have something definite. It is not affected by bad coke, by bad oil, by gas, or unequal draught. A given number of amperes forced through a conductor at a given pressure produces heat as definite and results as positive as a rule in mathematics. In fact, by Joule's laws, it is possible to determine with pencil and paper beforehand the exact amount of heat that will be produced by the various arrangement of volts, amperes, and resistance.

We have something here which we have never had before. By the use of a rheostat we have a means of raising or lowering the heat almost instantly, or of retaining it at a given heat for any length of time. In fact, it is the ideal method for the use of heat for any purpose, but in no instance does it seem to find as fitting a place as for continuous-gum work.

The ease with which electrical energy can be controlled makes it possible to arrange various ways of automatically raising and cutting off the heat at any desired point. This is a great advantage where one does not care to learn to operate by hand. For this purpose I have devised three instruments, two of which have been made known before, and a third and more scientific one I will present to-night.

The first was an arrangement whereby the current is gradually increased and cut off by clock-work. Starting at the hour of twelve, the minute-hand travels around, and in exactly every seven and one-half minutes it passes on to a new segment, which cuts out resistance and increases the heat in the muffle. After experiment, I find the most practical results are obtained by consuming about thirty minutes in fusing, commencing with a cold oven. If all bodies and enamels required the same heat and all electrical currents were alike and constant, the last segment could be a fixed point, but to meet these various conditions this one is made movable by a thumb-screw so that it can be set at any desired heat to be attained. The Allen body requires more heat to fuse than the Close, so the last segment is set one minute and thirty seconds longer. There is a difference of about fifteen seconds between Close body and Allen gum. When the arm reaches the end of this last segment, the current is instantly cut off by the operation of a spring. It might be stated here that for the best results in porcelain work it is best to select one material which suits your taste, and adhere to it. Study and familiarize yourself with that one material, and the results will be more uniform.

The second method is one for automatically cutting off the current like spur, and thus in part separated from the anterior part. The recess may have contained pus. The patient made a good recovery. There has been no return of the neuralgia, but the empyema has been a little tardy in disappearing. At this date, after a lapse of four months, the patient is entirely free from neuralgia, and subject only to a very slight occasional purulent discharge from the sinus into the nose.

Syphilitic disease, of course, may be located in the maxillary sinus as well as in any other part of the economy. I simply mention the fact of the possibility of occurrence, since cases are occasionally detected. They require no special consideration.

In very old people who have lost their teeth, a disposition exists for the maxillary sinus to expand as the alveolar processes are absorbed. The floor of the maxillary sinus is brought in contact with the gums. Instances of this kind are known in which the maxillary sinuses are the seat of purulent inflammation, and so thin is the wall of bone intervening between the mouth and the sinus that they were opened with a gum lancet.

All affections of the maxillary sinus appear to be much less frequent in the well-to-do than in the poor class of patients. Judging from my own experience, about eight per cent. of the crania obtained from dissecting-rooms exhibit evidences of inflammation of these parts. Physicians in charge of large dispensaries report that one or two cases of antral disease are generally found at any time on the list of applicants, yet dentists in large practice inform us that they almost never see diseases of the maxillary sinus. One gentleman of extended experience tells me that in his entire career of forty years he has seen but a single case. Certainly in rhinological practice they may be said to be not infrequent, and the affection should be thoroughly studied in all its phases by any one preparing himself to undertake this line of medical work.

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# NOTES UPON ELECTRICAL FUSION OF PORCELAIN.

BY L. E. CUSTER, B.S., D.D.S., DAYTON, OHIO.

(Read before the First District Dental Society of the State of New York, February 12, 1895.)

AT the last meeting of the Ohio State Dental Society I presented a paper and showed an electrical appliance for fusing porcelain. Since then I have been at work upon a line of accurate measurement of electrical heat and the cost of the same.

Since we are using a new source of heat, I departed from the old muffle-shaped oven to a form more in keeping with this new agent. The perfected instrument consists of a separable flask-shaped oven, with an inner cavity large enough to contain a set of teeth. Upon the whole inner surface is imbedded the electrical conductor, just deep enough to be supported while so highly heated and yet to radiate its heat directly into the cavity. An oven large enough for a full case can be operated by any current used for electric lighting.

The source of heat being a platinum wire electrically heated, it will be seen that we have a heat that is unlike any heretofore used for this purpose, and since it gives rise to no products of combustion, it is continuing obstinate, led me to make a careful inspection of the facial structure by transillumination ; to my surprise, the entire right side of the face was much more opaque than the left. Pressure over the maxillary sinus above the gum on the right side yielded a dull pain, which had not been complained of. The patient was of full habit, and lithemic. The opacity gradually disappeared by attention to general health and the use of alteratives.

In a second case, also of nasal disease (chronic nasal catarrh), in a lady in middle life, suspecting disease of the sinus, I made a careful examination by transillumination, without result ; some time afterward, not being quite satisfied of the validity of the previous test, I repeated it, and found that the light did not pass through on the right side. In both these cases I concluded there was a fluid occupying the sinus, preventing transillumination of light, which did not distend the chamber and which did not escape into the nose.

It is probable that the instances in which this effusion occurs are more numerous than we have supposed, owing to the fact that prominent symptoms are not created by the presence of the fluid. It would have been a mistake, in my judgment, to have opened the sinus in either of these cases.

Occasionally diseases of obscure character are located in the region of the maxillary sinus which do not readily admit of classification. A case of this character may be here outlined : A gentleman reported suffering from pain in the right side of the face, in which I was unable to determine the cause. After a futile study, the patient was etherized and the parts thoroughly explored. The sinus was opened in front at a point posterior to the canine fossa. Everything was found to be in a perfectly normal condition ; nevertheless, the patient rapidly recovered. Opening the sinus thus cured a pain which was centered in the region of the face.

Let me narrate a second case. Localized neuralgia of the nature of tic douloureux was confined to the tissues upon the right side of the face, in a married woman aged thirty. The parts were swollen, and the entire region of the cheek, including the malar bone, was unduly prominent. The pains were intermittent, attended with heat, flushing, and convulsive movements of the muscles of expression. The skin was at all times branny, shining with excess of sebaceous secretion, and of a redder color than that over the rest of the face. There was no discharge either into the nose or the throat ; the molar teeth had been futilely extracted ; the first bicuspid and the incisor were dead. The test of transillumination was negative. I etherized the patient and carefully explored the parts. The sinus was opened, and found to be apparently normal ; the cheek-tissues were dissected up as far as the lower part of the orbit, and the infraorbital nerve dissected from the point of escape from the infraorbital canal, and a portion measuring one centimeter in length excised. The sinus was opened on a line with the canine fossa, and found to be empty. It was packed with iodoform gauze, and, greatly to my surprise, on the following day on removing these strips they were found to be saturated with pus. It was not possible that the pus could come formed from a perfectly normal sinus in so short a time, and I inferred that there had been pus somewhere in the sinus before operation, probably in the posterior part, which is occasionally provided with a septum-the root of a tooth is the condition which associates this disease with dental practice in a conspicuous manner. It is important to remember that a very slight amount of pus will sooner or later tend to find its way into the nose, so that the purulent discharge in the nostril should immediately lead the observer to examine the teeth, and if any of the molar or bicuspid series be found defective they should receive prompt attention. Extraction of the offending teeth will cure the purulent discharge in a very short time, provided that no degenerate processes are set up in the mucous membrane or bone. It will sometimes happen that after teeth have been extracted and the pus collection entirely removed, relapses will occur. In such cases we have one of three conditions to study : irritation from imperfect absorption of the bone about the bottom of the old socket ; imperfect healing of the wound created by extraction, or the presence of inspissated masses (the products of inflammation) in the chamber itself.

Second. The results of dental irritation may be present in persons of a rheumatic diathesis. But inflammation of any kind, whether excited by disease about the root of a tooth or not, may extend rapidly into the sinus. Such cases are more apt to occur in middle life than at any other period, and I have reason to believe they are more common in those with history of alcoholic excess than in the temperate.

Rheumatic inflammation may occur on both sides of the face.

Third. Disease of the frontal sinus if neglected is apt to extend into the maxillary sinus. In more than one instance, after treatment of the frontal sinus, the discharge into the nose continued, and I performed a second operation upon the maxillary sinus, with result of demonstrating that empyema had existed in both the chambers. I have seen several cases in consultation where, after treatment of the frontal-sinus empyema, the same condition was detected in the maxillary sinus.

Fourth. The occurrence of a polypoid mass on the wall of the maxillary sinus may occur in the latter stage of any disease affecting this chamber ; whether these growths are at any time the exciting causes of collections of pus is uncertain. This condition is perhaps the most inveterate of any to which the maxillary sinus is subject. Fortunately it is rare.

Fifth. In the last place we have occasionally present effusion occurring in the maxillary sinus. I have not seen this condition described, and it was unknown to me prior to my custom of using transillumination as an aid to diagnosis of disease in this portion of the body.

No case has come under my notice in which I could prove that inflammation of the maxillary sinus had extended from the nasal chamber. On anatomical grounds such an extension is readily explicable. I acknowledge that the difference between the two cases here detailed and those of inflammation of high grade is only one of degree.

I remember in this connection the case of a lady of middle age, who reported to me on account of deafness due to spastic inflammation of the middle ears. There was a large posterior hypertrophy of the inferior turbinated bone on the right side, and ulceration on both sides of the triangular cartilage of the septum. The disease

# DISEASES OF THE MAXILLARY SINUS.

BY HARRISON ALLEN, M.D., PHILADELPHIA, PA.

(Read before the Academy of Stomatology, March 12, 1895.)

THERE is probably no subject in clinical medicine which has undergone greater change in the last few years than that of diseases of the maxillary sinus. Prior to the time when we obtained aid by reflected light in inspecting the nasal chambers, and to the use of the electric lamp in transillumination, the diseases of the sinus were not detected in their early stages.

The older writers said, for example, that one of the signs upon which physicians must depend for diagnosing pus in the sinus is a thinning of the anterior wall. This was said to be pushed forward and to crackle under pressure of the finger at the canine fossa. Another sign relied upon was the fullness over the sinus and general swelling from the eye downward ; some, indeed, spoke of the elevation of the floor of the orbit ; in a word, all the tests depended upon the supposition that the chamber itself was over-distended. Thus Salter ("Holme's System of Surgery," 1864, vol. iv. p. 27) gives the local symptoms as follows : "The expansion of the whole jaw ; the fossa beneath it full and prominent ; the molar teeth on the affected side appear to elongate ; the concavity of the hard palate becomes flat or even convex ; the nostril on the corresponding side is more or less closed ; in severe or protracted cases the floor of the orbit becomes so pushed up as to protrude the eye."

Erichsen ("Science and Art of Surgery," American edition, p. 709) describes the cheek in "dropsy of the antrum" as being round and prominent and indolent ; a semi-elastic tumor forming in it and protruding out of it, and giving rise to the egg-shell or parchment crackling on pressure.

In Gross's "System of Surgery" the description, both of the inflammation and suppuration of the maxillary sinus, is denotive of graver conditions than I am aware is ordinarily met with ; at least such states as those described by Gross are occasionally seen, but that they do not express the phase of diseased action met with in rhinological practice, I am convinced.

In common with all other physicians who are interested in diseases of the nose and adjacent parts, I have seen many cases of maxillary disease, and I may say in a single instance only were the signs enumerated above, present. The older writers evidently had in view a distinct condition.

Speaking entirely from the results of my own experience, I would say that diseases of the maxillary sinus are of five kinds, mentioned herewith, in the order of their frequency : First, a secondary pus-formation dependent upon irritation at the root of a tooth. Second, a purulent inflammation seen in rheumatic subjects, and not to be separated from exhibitions of rheumatism seen elsewhere in the economy. Third, extension of empyema of the frontal sinus into the maxillary sinus. Fourth, polypoid degeneration of the mucous lining of the sinus. Fifth, presence of sero mucus, formed under catarrhal excitement.

First. Pus in the maxillary sinus when arising from irritation at or depressing ailment, the greater the likelihood of a transmission of impaired nutrition to the child, resulting in an imperfect development of bones and teeth. After birth, all known factors provocative of the disease should be eliminated. The mother's milk should be examined, and, if defective, cow's milk or some of the infant foods substituted. Fresh air, daily baths, and frictions with sweet oil are indicated.

Of all foods, none has taken so high a rank as cod-liver oil. When the depressing influences are removed, a marked improvement is at once observed after its administration. Phosphorus has been highly recommended by many practitioners. Lime-water, the syr. ferri iodidi, and arsenic are also useful. As the child advances in years, all that is required is a continuance of improved hygienic conditions and a plain, generous diet. Bearing in mind the fact that the malnutrition of the teeth is but a single manifestation of a disturbance in the general nutrition, and that the imperfect calcification is not due so much to an imperfect lime-supply as to a want of assimilative power on the part of the protoplasmic basis of the teeth, it does not seem that a search after a special food is in accordance with the right therapeutic method. The above statement is borne out by the fact that in many rickety children the urine contains an excess of phosphates.

A similar, though of course not identical, loss of lime from the bones and teeth is witnessed in pregnant women. The rapid growth of the young child necessitates a large food-supply. For this purpose the blood-vessels of the uterus and associated parts undergo an excessive hypertrophy, the influence of which is felt in the most remote portions of the body. The ossification of the fœtal bones necessitates a large quantity of lime. In well-nourished women with good digestion, this is furnished partly by the food and partly by the mother's tissues. But, inasmuch as many women suffer during the period of pregnancy from extreme gastric disturbance, both their food-supply and assimilative powers are diminished. Under such circumstances the tissues of the body yield up their nutritive materials for the growth of the embryo. The bones, through a process of vascular absorption, part with a portion of their lime-salts. The pelvic bones and the vertebræ are frequently the first to suffer, though the entire osseous system may become more or less involved. The teeth experience similar changes. The blood-vessels of the pulp, in virtue of their absorptive power, impair the integrity of the chemical union of the lime-salts and the organic dentine, and in consequence the former are carried away and the latter decalcified. It is conceivable that under such circumstances the enamel might feel this absorptive influence and part with some of its lime, more especially from its under surface, and thus become thin and easily fractured. Should there be abrasions of the enamel, permitting the entrance of micro-organisms, the partially decalcified dentine would undergo speedy disintegration. With the birth of the child and the re-establishment of the digestive functions, a recalcification of the bones takes place, and they return to their normal condition of solidity. Could the teeth be kept free from the destructive action of bacteria, and the strain and pressure incident to mastication, they also, there is every reason to believe, would return to their normal condition of calcification upon the ordinary diet to which we are accustomed, and without reference to any special class of lime-bearing foods.

and on the surfaces of the flat bones a similar hypertrophy exists. The proliferating layer of the periosteum is preternaturally enlarged. The shaft of the bone is covered by a layer of spongy material resembling decalcified bone. Here also the newly-formed tissue is excessively vascular. In this new tissue are found all the evidences of the preparatory stages in ossification, but the deposition of lime is not followed by assimilation and the perfect formation of bone. The fault appears to be due to an imperfection in the activity of the protoplasm, and indicated by a want of assimilative and retentive power. In addition to these changes in the skeleton, various alterations in structure are found in nearly all the viscera of the body, indicative of some profound defect in the nutritional process.

Various theories have been advanced in explanation of this disturbed nutrition of bones, but none are satisfactory. Among these may be mentioned that which presupposes the presence of lactic acid in the blood in excess, produced by the fermentation of starchy foods in the alimentary canal. This acid circulating in the blood holding the lime in solution, prevents its deposition. This, however, is purely theoretical. The inflammatory theory is also without any basis. The highest authority on the pathology of rickets, Professor Kussowitz, believes that the primary lesion is the hyperemia of the cartilage, bone, and periosteum, dependent upon an increase in the size of the blood-vessels. This increased vascularity disturbs the normal nutritive process, and as a consequence the cartilage-cells rapidly proliferate, the surrounding substance becomes softer, and the bone lacks firmness and solidity. The same authority has demonstrated experimentally that a defective deposition and assimilation of lime-salts follows a hyperemic condition. Not only does the increased vascularity interfere with the assimilation of the lime-salts, but favors the absorption of that previously deposited, so that a previously formed bone will in a short time become soft and flexible. Coincident with these changes in the bones, similar changes are taking place in the areas of tooth-development. Not only are structural changes manifested in the superior and inferior maxillæ, but also in the teeth. The normal process of dentition may be arrested, and, if the disease develops before the eruption of the teeth, it may be indefinitely postponed. If some few teeth have appeared, further development is delayed. Those teeth which have made their appearance are defective in chemical composition, the relative proportion of organic and inorganic matter is disturbed, the dentine is soft, and the enamel imperfectly formed. Partly owing to the acid fermentation in the stomach and the activity of mouth-bacteria, these teeth speedily decay, become black, and drop from the alveolar process. There is in the majority of cases a hyperemic condition of the alveolar process which simulates scurvy, and is similar to the hyperemia in the bones. The causes of this profound disturbance in general nutrition are various and complex. Want of sunlight, impure air, prolonged lactation, starchy foods, indiscriminate indulgence in eating, constitute a combination of causes which in a feeble constitution will develop the rickety condition.

The treatment of rickets must be both prophylactic and curative. If the mother, during the period of pregnancy, suffers from the tubercular diathesis, chronic diarrhea, suppuration, or any exhausting of the teeth, but of other tissues as well; or, failing in this, to arrest pathological changes as speedily as possible. What has been said of this diathesis is true for all others which leave traces of their presence in peculiarities of the teeth.

There is probably no condition of malnutrition in which particular articles of food containing specific nutritive principles seem more pointedly indicated than that characterized by softening and distortion of the bones and the early decay of the teeth, and which is known as rickets. Here as anywhere lime-carrying foods seem to be the one desideratum, and yet a careful study of this condition soon discloses the fact that the disease is maintained not so much by a want of special articles of food, as by an inability on the part of the protoplasm to assimilate the nutritive materials furnished it, in consequence of its impairment by extraneous forces.

A brief account of the symptoms and pathology of this disease will make this fact apparent. It usually makes its appearance about the sixth or eighth month of infantile life, less frequently from the eighteenth to the twenty-fourth month, rarely after the second year. In some instances digestive disturbances precede the manifestation of bone lesions. Farinaceous articles of food are imperfectly digested, giving rise to acid products, chief of which appears to be lactic acid. Tenderness of the body, slight febrile disturbances at night, profuse sweating about the head and neck during sleep, are symptoms generally present. About the same time changes in the bones are usually noticed. Nodular enlargements may be distinctly seen in the ribs at the junction of the bones with the sternal cartilages, the shafts of the bones become soft, the vertebræ share in the same process, and, in consequence, more or less distortion in the conformation of the thorax takes place. The articular ends of the long bones undergo enlargement at the junction between the shaft and epiphysis; the shaft also softens. The flat bones of the skull become thickened and softened. To mechanical causes, such as the weight of the body and the play of muscles, all the distortions characteristic of this disease are due.

The changes in the bones of the head and face are particularly interesting. The skull is enlarged; its antero-posterior diameter is increased; the fontanelles remain open long after the normal period of closing; the parietal and frontal bones are thickened at their centers, forming prominent bosses; ossification is imperfect; the forehead becomes broad and prominent and out of proportion to the face, a condition which is exaggerated by an arrest in the growth of the facial bones, particularly the superior maxillæ and the malar bones. The inferior maxilla is peculiarly modified. The normal curve disappears, the anterior portion becomes flattened; at the situation of the cuspids it bends abruptly backward at a sharp angle, which has been attributed to imperfect growth of the middle portion of the bone. If a section of a long bone be made, evidences of hypertrophy present themselves. The narrow zone of proliferation between the shaft of the bone and the epiphysis, instead of presenting the usual reddish-gray appearance, is greatly enlarged, bluish in color, thickened to the extent of half an inch, and much softer in texture. The line of ossification is irregular, spongy, and more vascular than in the normal condition. In the shafts of the long bones provided this be sufficient in quantity and quality. The food-supply being provided for, the evolution of a tooth under the influence of the protoplasm should be perfectly normal; that this is not the case in all instances is evident. The cause of the perverted nutrition is a defect in the character of the protoplasm, due to the operation of some inherited specific influence.

By the term calcification let it be understood also a chemical union, not a deposition merely, between the lime-salts and the organic dentine brought about by the agency of living protoplasm; moreover, let it be borne in mind that calcification once established is not forever permanent, but that living dentine, like living matter in all other portions of the body, in the performance of its functions is continually undergoing disintegrative changes giving rise to waste products which are removed by blood-vessels and possibly lymphatics, and at the same time undergoing integrative changes by the assimilation of nutritive materials furnished by the blood-vessels of the pulp. We conceive, therefore, that the evolution of a normal tooth will depend on the physiological activity of a highly differentiated form of protoplasm, differing somewhat in chemical composition and life duration, as found in the cells of the enamel organ, the ameloblasts, and in the cells of the dentine organ, the odontoblasts.

This being accepted, it inevitably follows that the introduction of an extraneous force, capable of impairing the composition of protoplasm and interfering with the harmonious play of its physiological forces, would result in an impairment in the products of the activity of that protoplasm. It might be in the character of the enamel or dentine and related to density or chemical composition, and this no matter how perfect the food-supply might be. It is not a question of food-supply in the majority of instances, but a question of imperfect protoplasm. As long, therefore, as some extraneous force is active, so long will there be imperfect tooth-formation. In all instances the problem reduces itself to two classes of factors, viz., extraneous influences and food-supply, the relative importance of which must be determined by the practitioner himself. We have abundant evidence of the pernicious activity of extraneous influences upon the normal activity of protoplasm in the development of the tissues in the syphilitic, the tubercular, the scrofulous, and gouty diatheses. In all these constitutional states the pathological changes in the tissues have no direct relation to the quality of the food, but to a disturbance of their assimilative power. In the inherited syphilitic diathesis, for example, the constructive or assimilative power of the protoplasmic basis of the entire body is disturbed or impaired by the syphilitic virus, and, in consequence, there is an impairment in the development of the epithelial tissues, including the teeth, of the fibrous connective tissues, including the cartilage and bones, and even of the muscular and nervous tissues. Under such circumstances the primary object must be the restoration of the protoplasm to its normal status by the removal of the specific influence, not by the employment of any special articles of food, but by special medicinal and hygienic agents. It becomes the duty of the dental practitioner, therefore, to familiarize himself with the protean manifestations of this diathesis as presented in both parent and child, so as to be able by advice, at least, to save a child yet unborn not only from an imperfect development

# OBSERVATIONS ON THE NUTRITION OF THE TEETH.

BY ALBERT P. BRUBAKER, M.D., D.D.S., PHILADELPHIA, PA.

(Read before the Pennsylvania State Dental Society, July 10, 1894.)

THE relation of food to the life history of the teeth, and the possibility of modifying their nutrition, either favorably or unfavorably, by suitable or unsuitable foods, are problems which have for a long time enlisted the interest of the dental practitioner. The possession of therapeutic measures, either dietetic or medicinal, which would favor the development of a tooth possessing the ideal characteristics of form and chemical composition, or which would arrest disintegrative changes once established, has always seemed a possibility. The fact, however, that no well-defined course of dietetics, much less a specific class of foods, has as yet been offered which would meet the indications just alluded to, suggests the possibility that the dental practitioner has not approached the special problems of tooth-nutrition from a sufficiently general point of view.

It is not with the idea of suggesting any specifics in the long list of foods which would have a selective influence on the nutrition of the teeth that this paper is presented, but rather with the purpose of emphasizing the necessity of a more intimate acquaintance on the part of the practitioner and student, not only with the physiological processes, but the pathological processes which affect the body as a whole, and of which the changes in the teeth are but special illustrations. This having been done, the limitations and capabilities of foods as modifiers of tooth-nutrition will become somewhat more apparent.

If I correctly understand the views entertained by the majority of writers on dental pathology, the imperfections of enamel and dentine are attributed to defects in structure and function of the enamel-forming and dentine-forming organs in consequence of a deficiency of lime-salts in the food-supply. In this paper the attempt will be made to establish the proposition that the imperfect enamel and dentine are due to defective enamel and dentine-forming organs, consequent not to a deficiency in food-supply, but to the operation of extraneous forces which impair the assimilative power of the formative organs, resulting in a failure to retain the lime-salts furnished in sufficient quantity by the ordinary foods. A few words as to the physiological development of the teeth may be of assistance in arriving at correct conclusions. It is well known that the primitive organic basis of both the enamel organ, the ameloblasts, and the dentine organs, the odontoblasts, is that highly complex, unstable compound, protoplasm, consisting of water, albumin, sugar, fat, and inorganic salts. In the performance of its functional activities, namely the production of mature enamel and dentine, it undergoes various disintegrative changes, which if not arrested would result in its ultimate destruction. This is provided against by the constant supply of nutritive materials furnished by the lymph stream. Inasmuch as one of its specific functions is the formation of enamel and the calcification of newly-formed dentine, it is evident that among the inorganic salts the calcium salts must occupy a prominent position. These are furnished in pre-natal life partly by the calcified tissues of the mother, and partly by the food; in the post-natal life by the mother's milk, blood and in the secretions, and taken together with the fact of the breaking up of the organic acids in the blood, which has been mentioned, and the immunity of certain persons from caries of the teeth in the presence of the organisms productive of the disease, gives strong plausibility to the suggestion.

But there are other observations that are possibly still stronger. It was shown by Sternberg years ago that micro-organisms habitually growing in human saliva have the power to destroy rabbits, but are not pathogenic for man, who is supposedly protected from their virulence by some defensive proteid. This seems to be the only principle discovered upon which the differences of the immunity of animals can be based. The principle of vaccination against smallpox must, for the present, rest upon the immunity, partial as it seems, of the cow, and the influence exerted upon the potency of the smallpox virus in passing through that animal, together with the excitation of a similar protective proteid in man.

Again, every dentist of long and careful observation has not only seen persons immune from caries of the teeth, but has seen persons whose teeth decayed badly at one time, become apparently immune at some after-time. Such cases as this: a lady who has been my patient from childhood suffered much from caries during her teens, and a large number of fillings were necessary. At the age of twenty-two she became immune, and no signs of new decays occurred and no fillings failed for about fourteen years. Then suddenly, as it appeared, some half-dozen new decays occurred together, and two proximate fillings began to fail at the bucco-gingival angle. These were filled, and during the year two or three other decays appeared. Since then several years have passed without other decays occurring. Now, this class of observation in somewhat less pronounced form is not very uncommon. In large degree it has been this class of observation that has led to the widespread interpretation of soft teeth becoming hard, and of hard teeth becoming soft. But the conception that some power or influence is acting through the medium of the oral fluids to produce the differences is forced upon us by the consideration of all the facts presented.

Still, it must not be forgotten that the degree of virulence of caries may be dependent in a measure upon still other influences.

It is now well known that the organisms producing caries become impotent in the complete absence of sugar, or other substances readily convertible into sugar. This cannot be supposed to occur in the human mouth. But vast differences in the supply of sugar, or sugar-forming substances, as starch, etc., occur, and the greater prevalence of caries in the teeth of millers, bakers, candy-makers, and persons who are habitually mincing sweetmeats, has been widely noted and generally attributed to this cause, that is, to the unusual supply of fermentable material. Differences in personal cleanliness and some other potent conditions must for the present bear the ignominy of being causative of extreme degrees of the carious processes. But how often do we witness cases of the worst type in persons in whom none of these are active.

(To be continued.)

sive proteids, if one is to understand what extreme importance is to be attached to their discovery, and the prosecution of researches upon them."

These defensive proteids are divided into three classes. First, those that possess germicidal action. The strongest example of this class is found in the blood-serum of the white rat. This animal is refractory to inoculation with anthrax. Behring found by direct experiment that the blood-serum of the animal destroyed the anthrax bacilli. By comparative tests he shows that two and a half cubic centimeters of rat serum possessed the same germicidal power as would the same quantity of corrosive sublimate solution, one to one thousand. The most striking property of these defensive proteids is that, while they are so destructive to bacteria, they are in no degree poisonous to animals, and it thus becomes possible to employ them for the prevention or cure of infectious diseases.

The second class are those that, while permitting bacteria to grow, prevent the formation of, or modify, their toxic products, and are called attenuating proteids. Certain animals that are refractory to anthrax, but permit the growth of the bacilli, produce an attenuating influence upon the organisms, and Ogata and Iasuhara have shown that this attenuating influence resides in the serum of the animals experimented upon, and not elsewhere; and further, that this attenuating influence continued to exist in the serum after removal from the animal, and that it could be made to serve as a retarding influence, or as a curative agent, in animals inoculated with anthrax.

The third class are known as antitoxic proteids. The first announcement of this class was by Behring and Kitasato in 18[illegible]0. "They had found that the blood of rabbits protected against tetanus had the power to destroy the alkaloid of tetanus (tetanine) in the lifetime of the animal attacked. They also found that it was not only possible to protect the animal against an inoculation of the tetanus bacilli, but also to cure it after the inoculation had taken place, and even after the appearance of the symptoms of the disease."

The importance of such results as these can scarcely be over-estimated, especially since they have been verified by several independent observers. Almost immediately after this discovery came a similar announcement in regard to diphtheria by Fraenkel and Brieger. In this the blood-serum of animals rendered immune by inoculation proved sufficient in itself to protect other animals from the effects of inoculation, and even to cure them after the disease had appeared. At present this serum is being widely tried for the cure of diphtheria occurring in children, and the reported results are full of promise. One striking feature of this last class, the antitoxic proteids, is, that it is something acquired that seems not to have existed before in the blood-serum, or, if it existed, was too small in quantity or too slight in efficacy to protect the animal. It seems to be a digestive ferment, agreeing in its principles of action and in the conditions of loss of power with other digestive bodies. Its formation seems to be stimulated in the time of need for the destruction of a poison present, and continues to exist in the serum for an indefinite time.

While all of this may be different in its detail from anything we may expect to find in the human mouth, it illustrates a principle of the formation and action of deterrent proteids in the serum of the dissipation is greatly different in different individuals. These considerations seem to force the conclusion that the oral fluids contain some deterrent substance, or principle, that is more potent in its action in some persons than in others.

What could be such a substance? It is now well known that the organic acids when taken into the blood are quickly decomposed by some principle existing in the blood itself, or furnished by the cellular elements with which the organic acid comes in contact. Therefore, such of the organic acids as have in them elements of a readily formed alkaline base tend, by their administration, to produce alkalinity of the excretions instead of acidity, which would be the case were they not broken up. From this point it is not difficult to arrive at the conception that the organic principle that breaks up these organic acids within the blood, or the tissues, may also appear in the saliva, and be much different in its potency in different individuals; or even in the same individual at different times of life; or, again, that variations may occur under differences of physical health or condition. *With this view of the case, a strong disposition to caries of the teeth becomes as truly a dyscrasia as gout or rheumatism.*

At this point we may turn to the developments derived by experimental experts in recent years, to see whether or not something has been found that gives plausibility to such a supposition. No examinations of human saliva, with this end in view, have been made, but in other fields results have been obtained.

It has been a long time now since the theory that immunity from micro-organisms might be due to the presence of a deterrent substance in the blood entered the minds of scientific men, this substance being something that would prevent the growth of the invading bacteria, or prevent the development of their toxic poison, but it has been an exceedingly difficult matter to secure evidence upon this point. The first experimental researches were negative, "but in 1884, Grohmann (my quotations are from Reference Hand-Book of the Medical Sciences, 1884 Supplement, page 234) showed that fresh serum exerted an attenuating influence upon the bacilli of symptomatic anthrax. Todor found that fresh blood destroyed them, while Nuttall established the fact that organic fluids, blood-serum, pericardial fluid, etc., really possessed the power of destroying bacteria, and that this germicidal action was taken away by raising these fluids to a temperature of about 60° C. Buchner showed that this power rested solely in the serum, and that the breaking up or mixing it with the blood-corpuscles masked, or diminished, its activity. He also showed that repeated freezing divided the serum into layers, of which the lowest was the most active in destroying bacteria, and that this power of the serum is destroyed if it be diluted with distilled water.

"After Buchner, the most important work has been done by Ogata and Iasuhara, and Behring and Kitasato, in showing the great influence of the fluid portion of the animal tissues in the acquisition of immunity. According to the work of these authors, immunity is due to the action of albuminoid substances, called by Hankin 'defensive proteids,' which have the power of destroying pathogenic bacteria, of attenuating them, and of destroying their toxic products.

"It is necessary that one should have a clear idea of these defenother than those resulting from differences of form and of cleanliness? In the present state of science no satisfactory answer can be given. The best that can be done is to suggest the direction that seems most promising for future study. With this end in view, a few observations may not be uninteresting, and as the years go by may grow into importance.

One thing has struck me very forcibly since the admirable experimental work of Dr. Miller, of Berlin, in 1884–5 (see "American System of Dentistry," Vol. i, page 797). Here it is recited that caries of considerable depth occurred, the tubules became distended so that the walls disappeared and cavernous openings appeared which were crowded with micro-organisms, and that moderately thick sections of dentine were completely decalcified,—all under artificial conditions in his test-tubes, *and within four weeks' time*. This observation I have myself verified, and the difference in the rapidity of progress of caries thus produced artificially in test-tubes and that occurring under what may be called natural conditions within the human mouth contrasted. I have never seen caries in the mouth progress with such rapidity under any conditions whatever, either in teeth with living or dead pulps. Perhaps some part of this difference may be explained by the absorption and removal of the acid formed by the micro-organisms through the continuous flow of the oral fluids, thus preventing the same degree of concentration of the acid products. But at best this can be but a very partial explanation of the phenomena observed, and is no explanation whatever of differences in the susceptibility of the teeth of different individuals.

It is known that micro-organisms do not grow so well in the concentration of the lactic acid which occurs in our culture-tubes, and that if this is allowed too great a concentration their growth ceases entirely. Yet they will penetrate dentine farther in the same length of time in the tubes than they will do in the mouth. If this proposition is correct, we must conclude that there is some deterrent action or force operating within the human mouth that is not present in the test-tubes,—a force of some kind, or of some nature, that acts to hinder the destructive effects of the products of the micro-organisms, either by restraining the growth of the organisms, by hindering the production of their typical acid excretions, or by limiting the effects of the acid excreted by the organisms. Such an effect seems not to be produced by any condition of the teeth themselves connected with their vitality, since the observation applies with equal force to pulpless teeth, or dead dentine, as to living dentine. Then this power, or deterrent force, is extraneous to the teeth; its action is from without. This hypothesis is further supported by the well-confirmed observation that the opening of a carious cavity by accident, or intentionally by breakage of overhanging walls, has a marked deterrent effect upon the rate of progress of the carious process. Such a condition does not appear to hinder the continued growth of micro-organisms, but it does seem to dissipate the products formed by their growth, and in a marked degree prevent their action upon the teeth. This again may in some degree be explained by the simple absorption of these products by the flow of saliva. But this kind of dissipation of the products would be measurably the same for different individuals, while the observation is that the effect of the duce an acid excretion which slowly acts upon the tooth-structure, causing a decalcification, first of the enamel, admitting the growth to the dentinal tubes which they enter, after which the decalcification of the dentine proceeds little by little, the growth following up as the decalcification prepares the way, until the crown of the tooth is destroyed.

As a predisposing cause, those faults in the forms of the teeth, or of their development, such as bad forms of interproximate contact, unevenness of surface, fissures, etc., all of which give *opportunity for lodgment and continuous growth of micro-organisms*, has generally been acknowledged, and by most recent writers has been insisted upon as important. It follows from this that those persons whose teeth are best formed as to outward configuration and are most complete in the closure of their grooves, *i.e.*, presenting no fissures or deep pits, are least liable to caries. In an important sense this is correct, but it is insufficient to explain the facts clinically observed, or the wide variations that are presented in the disposition of caries to attack the teeth of different individuals. The teeth of many children begin to decay within a year or two after presenting through the gums, even though the configuration and closure of the grooves do not seem to be at fault. The teeth of many other children do not decay so early; indeed, a considerable number escape decay of their teeth entirely, or it is limited to the occurrence of a very few cavities, though the configuration of their teeth may be no better.

It seems to be admitted by all who have examined the subject from the standpoint of the bacteriologist, that the caries-producing organisms are present in every mouth whether caries occurs or not. I have myself made cultures from the saliva of many people, those in whose teeth caries was making sad havoc, and those in whose teeth no caries whatever appeared, and must say that I have found no mouth that was free from the caries-producing organisms. Then, if these micro-organisms are present in every human mouth, why is it that they induce caries in the teeth of the one and not in the teeth of another? Why is it that the teeth of the one are quickly destroyed, while there are only a few slowly progressive decays in the teeth of the other? Indeed, all possible shades of difference, from the rapid melting down of the teeth to complete immunity from caries. The popular answer to these questions, both by the profession and the laity, has been,—*differences in the physical qualities of the teeth.* Teeth that contained but a small percentage of lime-salts, soft teeth, have been regarded as most susceptible to caries, while teeth that contained a large percentage of lime-salts, hard teeth, have been regarded as least susceptible to caries.

This is shown by the examination of the physical characters of the teeth to be a fallacy. Examination of the density, of the percentage of lime-salts, and of the strength of the teeth, that are certainly reasonably accurate, and include a sufficient number upon which to base trustworthy judgment, has shown that neither the density, nor the percentage of lime-salts, nor the strength, is in any degree a factor in predisposing the teeth to caries, or in hindering its inception or progress.

The question now is,—what is the cause of the differences observed in the disposition of caries to attack the teeth of different individuals, times over. The Edison current is furnished us at three-quarters of a cent per ampere hour for lighting, including lamps,—that is, three-quarters of a cent per hour for one ampere at one hundred and ten volts pressure; but where it is used for power and other purposes the cost is but half that price. The large oven requires five amperes at one hundred and ten volts pressure, which would be one and seven-eighths of a cent for thirty minutes' use. You may comprehend this better by saying that this current is equal to ten sixteen-candle-power lamps. If you buy the current at the price for power and heat, a simple fuse of thirty minutes will cost less than one cent, and the small oven for crown- and bridge-work requires but half that. Or, if you choose to generate your own current, a one-horse power gasoline engine requires one cent per hour for operating. If this runs a dynamo requiring three-quarter-horse power, there is an output of five hundred and fifty-nine Watts, or a little over five amperes, at one hundred and ten volts pressure. This would be a little more than our requirements, still would cost but half that charged by the Edison people, or one-half cent per fuse. Could anything be cheaper?

In conclusion, I would add, that while I have gone out of the lines of operative dentistry in the invention and perfection of this instrument for the prosthetic dentist, I feel fully repaid by its success, for in it we have an instrument free from gas, ample for all requirements, perfectly controlled, cleanly, compact, and cheap in cost and operation,—in fact, the ideal appliance for fusing porcelain.

# CORRESPONDENCE.

## A "DIGEST" REVIEWED.

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—Will you give space in the COSMOS to a statement of my own understanding of the so-called "electro-chemical theory"? It is to be regretted that there is a necessity for this writing; but the *Dental Digest* for January contains an article which purports to be a digest of "a paper by Dr. S. B. Palmer on Etiology of Dental Caries," read before the American Dental Association, and those who have read that review will remember that the writer, whose name is not given, gave to the readers his own opinion, which was against the doctrines taught in the paper. To strengthen his position he quoted one who was most opposed, leaving out all that was said in favor, and closing with: "The sentiment of the members present seemed to agree with Dr. Harlan's position." I do not ask space to controvert the writer, but as proof that there is occasion for reviewing this review, I quote correctly from the *Digest*, and allow the reader to judge for himself:

"The paper, however, introduces the subject of root-filling, in which he condemns gutta-percha for that purpose, on the ground that it 'becomes changed in the root-canal, and becomes odorous.' The paper elicited but little discussion, and that seemed to indicate that but few converts to Dr. Palmer's views were present. Dr. Harlan seemed to think that he had pricked the bubble which Dr. Palmer had so earnestly presented, in the following remarks:

" 'Just what relation the filling of the roots of teeth has to etiology and physiology, I don't understand ; but as it has been introduced, I would ask Dr. Palmer how an essential oil could become oxidized in the root of a tooth ? Also, how gutta-percha could become oxidized in the root of a tooth ? and to ask the further question, if gutta-percha is an oxidizable substance, why is it that the man who laid the first Atlantic cable, and those who have since followed, used an oxidizable substance for covering that cable in the water ? I wish to say that from the theoretical standpoint, from the practical standpoint, and from the scientific standpoint, the best material we have to-day for the filling of roots of teeth is gutta-percha. It is one of the unalterable substances that dentists use, that can safely be placed in the root of a tooth without danger of disorganization.' "

In reply, the February number of the DENTAL COSMOS, page 163, contains the following :

"TO THE EDITOR OF THE DENTAL COSMOS :

"*Sir*,—In the November issue of the DENTAL COSMOS, page 894, Dr. Harlan, of Chicago, is quoted as saying before the American Dental Association, in reply to Dr Palmer's paper on the 'Etiology of Dental Caries,' as follows : 'I would ask Dr. Palmer how an essential oil can become oxidized in the root of a tooth, and how it is that, if gutta-percha is oxidizable, it is used for covering the Atlantic cables, which are laid in the water ?' Considering the importance of a root-filling being indestructible by exposure to moisture, I beg to quote from an article in Chambers' Encyclopedia on gutta-percha. It reads : 'It has been used for making a variety of articles, but its most important application has been the coating of marine electric-telegraph wires. In this application, as in most others, *its inherent defect*, arising from the readiness with which it becomes oxidized and decomposed, is unfortunately manifesting itself seriously, and a substitute having greater stability is anxiously looked for.'

"Farther on, it says, 'It is most probable that india-rubber will eventually displace gutta-percha in some of its most important applications, and especially in the coating of telegraph wires.'

"C. FISCHER, Chemist,
"917 Clinton street, Philadelphia, Pa."

We pass to the next statement :

"With reference to the main subject of the electro-chemical theory of decay, at the present time, with the published results of the experiments of Miller and Black, the electro-chemical theory of caries has no ground to rest upon. It seems absolutely determined by these experiments that decay of teeth is essentially the result of the agency of micro-organisms, through their excretory products. The electro-chemical theory of the production of decay is not proven, and the experiments of Miller must stand until something better and more definite is presented which can be substantiated, and experiments of which can be demonstrated before scientific bodies."

In answer to the above, the electro-chemical theory does not conflict with the experiments and conclusions of Miller. It rests upon that phase of caries advanced by Miller, and gives full credit for the work done on that line. Had the digest been intended to give an unbiassed statement of the paper, the following would have been quoted as well as Dr. Harlan's statement :

"Dr. MARSHALL. Dr. Palmer does not antagonize Miller's theory of decay in the paper read this morning. He talks rather about secondary decay. He is also talking about low-grade teeth, in which the loss of gold fillings cannot usually be explained, so that faulty manipulation has been set up as a scapegoat."

Readers of the *Digest* should have had the foregoing as well as that which was given. Again he quotes: "'With regard to secondary decay, I wish to say that the causes that produce decay in the first instance are those which produce it in the second; and that the electro-chemical theory has nothing whatever to do with it.' The sentiment of the members present seemed to agree with Dr. Harlan's position."

The above has been given to the profession as a digest of the paper which may be found in the DENTAL COSMOS for November, 1894. On reading the paper and discussions, it is apparent that the reviewer took the opportunity of quoting the one most in sympathy with his own views, while those contrary were not mentioned. This has led the writer to briefly summarize his understanding of the so-called theory, with respect to what it claims, what are its benefits, and upon what foundation it rests.

It claims that all operations for filling teeth introduce causes, the effects of which will result according to the relations of the material to the conditions of the teeth. It claims that relations may be known, taught, and practiced so that results may be calculated with an assurance of success, which, by practice, it would require many years to obtain.

It claims that secondary decay, in connection with metal fillings, is a phase of caries, as distinct from primary decay as decomposition in a battery cell with the liquid only is from that with the plates added. One is chemical, the other is electro-chemical; with one there will be potential and a current, the other will lack both. This principle causes a loose gold filling to excite dentine to sensitiveness where a filling of gutta-percha in like conditions would not. It claims as benefits, that porous dentine may be lined and filled with varnish of resinous gums, paraffin, etc., so as to insulate currents, and not less exclude moisture and chemical action beneath the filling. It is beneficial in that cavities so lined may be filled with amalgam which contains no copper. Such fillings do not blacken the dentine, or shade through the enamel.

The object of this study is to help place dentistry upon a scientific basis. It is not necessary to become one of the "few followers," as mentioned, but simply to observe the principles and practice,—call it by any other name,—and patients will be benefited. All know that Dr. Bonwill's practice has undergone evolution, and still he expresses disbelief in the theory under discussion. Yet he wisely discriminates in the choice of materials for filling, not only to use amalgam where he formerly would have used gold, but has given valuable instructions in its manipulation. He recommends the use of paraffin to fill porous dentine to prevent moisture under fillings. It is good practice. Call it an insulator, or non-conductor of thermal changes, it meets the requirements and prevents chemical action under fillings. If students can be believed, there are several professors still teaching the falsity of the electro-chemical theory. They are regarded as fair-minded, but this is certain: they labor under a mistake, and that is of connecting secondary caries caused by metal fillings with primary decay, and then declaring the theory false because it antagonizes Miller's teachings. Whether this is done through ignorance or intention, it will react. Even students are becoming interested in science, and many are already restless under the limitations of their instructions.

The writer only works to improve operative dentistry. After repeated statements that his views do not clash with primary etiology of caries, his writings seem to have given offence. All comes of misunderstanding. He will in future work in the field of operative dentistry, where science can be demonstrated to practitioners who can see, and know of themselves, rather than follow authority in science which cannot be demonstrated before a society. The writer claims nothing for the theory which has been connected with his name. Nor can he quote books for authority, nor has he the backing of superior advantages, nor even numerous opportunities to demonstrate his ideas. By its fruits will it be known, and of the fruits unprejudiced observing dentists will be the best judges.

It having been declared that "the electro-chemical theory of caries has no *ground* to rest upon," let us see what foundation it really has. It rests upon three piers:

1. Natural laws which arranged matter to form worlds, and which still govern their movements.
2. The etiology of dental caries as promulgated by Professor Miller and indorsed by the dental world.
3. The pile-driven foundation of scientific practice.

This cantilever arch will stand, the *Dental Digest* to the contrary notwithstanding. S. B. PALMER.

225 WARREN STREET, SYRACUSE, N. Y.

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# PROCEEDINGS OF SOCIETIES.

## FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a regular monthly meeting Tuesday evening, February 12, 1895, at the New York Academy of Medicine, No. 17 West Forty-third street; the president, Dr. V. H. Jackson, in the chair.

### INCIDENTS OF OFFICE PRACTICE.

Dr. JAMES G. PALMER. A case that has puzzled me considerably came into my hands last October. The tooth is a left superior central. The dentist who had the patient in charge for some years previously referred her to me, as she was coming to New York. He is thoroughly competent in regard to all such work. When he took charge of this tooth in particular, the pulp was devitalized, and had been for some time. The tooth had a large filling in it, which he removed. He cleansed and dressed the canal, and treated it for about three or four months before he was satisfied with it. He filled the root with gutta-percha. From that time up to the present—a period of about two years—the tooth has been sore and tender to the touch nearly all the time. There would be intervals of two or three days when there would be no discomfort. At other times, particularly during damp weather, it would be very annoying, so that even drawing the lip over it would give a sensation of pain. Pressing on the lateral corner, toward the median line, would give intense pain for a moment or two. During this time there was no irritation or redness of the gum to indicate the forming of an abscess. When the tooth became sore, she would use capsicum plasters until the pain ceased, and would then discontinue them. About two weeks ago she allowed me to remove the filling. I took all the gutta-percha out, washed out the cavity and canal carefully with warm water, but saw nothing to indicate any trouble. I dressed it with carbolic acid, and sent her away for a week. At the expiration of that time I removed the dressing, and the cotton was nearly dry, with only a carbolic-acid odor. She had had entire relief from pain. I then filled the tooth to the root again with gutta-percha, following Dr. Smith's idea of immediate root-filling, dressing it with carbolic acid after I had cleansed it out thoroughly. That was a week ago yesterday. To-day I saw her. On Tuesday there had been considerable pain and irritation, which is incident to filling so quickly; but for the next three days—Wednesday, Thursday, and Friday—she was free from pain. Since Friday, however, there has been the same irritation and annoyance as has extended over the past two years, and to-day she is feeling very much worried about it. My reason for bringing this before you is to ascertain, if I can, from any one present the cause of this trouble. I related the case to two or three gentlemen, and no one has thrown any particular light on the subject.

Dr. F. MILTON SMITH. Dr. Palmer left out in his statement one thing which he mentioned to me. The tooth is decidedly elongated.

Dr. PALMER. Yes, I omitted to state that fact. I believe the lady said that elongation occurred within a very few weeks after the first work in the root—about a year and a half or two years ago. Last Monday, when I filled the tooth, I trimmed the end considerably, so it should not appear so long. To-day she insisted that the tooth has elongated as much as it was before. I think she is somewhat imaginative. One gentleman to whom I spoke thought the drill had been used; but I am convinced that it had not, because, when I first removed the root-filling, I found the opening so extremely small that I had to enlarge it myself.

The PRESIDENT. Was the pulp destroyed artificially, or did it die a natural death?

Dr. PALMER. I believe it died a natural death. It was dead when it came into the hands of the gentleman I mentioned. From what he remembers, it was the result of thermal changes.

The PRESIDENT. Is the color of the gum normal?

Dr. PALMER. Yes.

Dr. A. L. NORTHROP. Dr. Palmer has not told us how much the patient grinds on the cutting-edge at night.

Dr. PALMER. Not at all. I cut it down so that she could not touch it. To-day she said it had elongated, and that she could touch the tooth underneath. She says there was an abscess over it—a swelling of the gum that did not discharge—previous to her going into the hands of the gentleman who sent her to me.

Dr. J. Y. CRAWFORD. I did not follow Dr. Palmer very closely in the clinical report of the case, but it impresses me that in all probability this is the kind of case of which we have quite a number. I, for want of a better expression, term it the condition of prolific action at the root of the tooth, such as we often see in the front teeth above and below. The devitalization of the pulp may result in the establishment at the end of the root of a condition of inflammatory action which may cause a process of proliferation that will gradually lift the tooth from the socket, producing such conditions as will finally result in the extraction of the tooth. I believe that the rational treatment for that pathological condition, and the only one that affords any help, is the removal of the tooth, removing the condition that is responsible for the trouble, and returning the tooth to place. While I would do that, I should condemn the almost universal habit of excising a small portion of the root of such a tooth before replacing it.

Dr. L. E. Custer, of Dayton, Ohio, then read a paper on the electrical fusion of porcelain, which he accompanied with a practical demonstration.*

### *Discussion.*

Dr. Meyer. I cannot enter into the discussion of electricity, but I wish to ask a few questions in reference to the fusing of porcelain. The essayist states that he finds the most practical results are obtained by consuming about thirty minutes in fusing. I would like to ask how much time he takes to bring the case to the fusing point?

Dr. Custer. Thirty minutes.

Dr. Meyer. How many minutes do you require for the fusing?

Dr. Custer. When it gets to the fusing point it is fused.

Dr. Meyer. Is there any particular point in your apparatus where the heat is the greatest?

Dr. Custer. No, the heat comes from all directions.

Dr. Meyer. What do you bake your case on,—on a base or on a slide only?

Dr. Custer. There is a little slide soldered on the tray to keep it from the bottom of the oven, so that the heat is distributed evenly.

Dr. Meyer. Then you have no base to bake the plate on?

Dr. Custer. If you are afraid it will warp, you might make a little base.

Dr. Meyer. Have you ever tried it?

Dr. Custer. Yes, I have obtained the same result; the base was only there to keep the platinum in shape.

Dr. Meyer. Which portion of the case heats first?

Dr. Custer. The heat comes from all directions, because it is entirely inclosed, except the small opening that you see there.

Dr. Meyer. I cannot see how it is possible to bake a case properly when the heat, as you say, comes from all directions. Take a practical case for an illustration. Supposing the body over the canine fossa is one-quarter of an inch thick, and the condyle and palatal surface of the plate is only one-sixteenth part of an inch, it certainly takes a higher and longer heat to bake the thickest part of the case than is required for the thinner portion. If you bake such a case in the apparatus which you show here, the thinner portion must certainly be over-baked and ruined. I use a two-muffle furnace, heating the case gradually in a preparatory muffle; and when thoroughly heated, placing it into the fusing muffle and exposing the most bulky portion of the case to the highest heat first. The heat not being alike all over the muffle, this portion will bake first; the case should then be taken out, and the thinner portions be treated in the same manner. When baked properly the body will have a glossy appearance, but not so glossy as to present a smooth surface. When the baking is completed, the case should be placed in a cooling muffle alongside of the furnace. The essayist also says, if all bodies and enamels required the same heat, a fixed fusing point could be established. Supposing a case that requires 3000 degrees of heat, and another 2000, and still another 1000, could the same current be used and the case be watched while it is being fused?

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* For Dr. Custer's paper, see page 430 of the current number.

Dr. CUSTER. Yes.

Dr. MEYER. Is it not a matter of experiment all the way through?

Dr. CUSTER. No, sir; not after the first. I have arranged a time appliance which is about as accurate as is obtained in practice.

Dr. MEYER. You mean that you have a time appliance whereby you fuse a certain body?

Dr. CUSTER. Yes.

Dr. MEYER. If Dr. Custer obtains the best result in porcelain work by using one material which suits his taste, does he not advocate it in order to have a fixed fusing point?

Dr. CUSTER. There may be variations in the manufacture of it; one material would give better results than two or three.

Dr. MEYER. I myself use four or five different kinds for the purpose of obtaining different results. I do not want the same shading of gum for every individual; but what I want to emphasize is this: if you have a uniform material of course you can make a fixed point of fusing, but not otherwise.

Dr. CUSTER. You can vary that after a little experience, having determined what each one requires, the same as with any other furnace. I want to show you the method of producing heat. I am not a porcelain worker at all; these things have come up in my experiments with the furnace.

Dr. MEYER. Is there any discoloration of the body and enamel in your furnace?

Dr. CUSTER. I have not seen any.

Dr. MEYER. The color of the body in specimens shown is not what I am accustomed to see after baking.

Dr. CUSTER. It is a cleaner heat than you ever had before.

Dr. MEYER. The essayist claims as an advantage, that it is not necessary to remove the case and expose it to the cold air after baking, but he leaves it in the furnace and turns off the current.

Dr. CUSTER. The current was turned off a few moments ago, and it is now cooling off.

Dr. MEYER. How long does it take?

Dr. CUSTER. It would take about an hour before you could handle it. If you wish to prolong the time, by putting in a stopper I think it would take about two hours; or you can put a glass globe over it, and it will then take about three and one-half hours.

Dr. MEYER. Do you see any difference in the color of the enamel cooled off by your method and the cooling of any other method?

Dr. CUSTER. If it cools too rapidly you do not get as good a result.

Dr. Meyer. My method of cooling differs greatly from that of the essayist. As I have already stated, I want a preparatory muffle to prepare a case properly, and then for the final bake I place it in the muffle where the heat is at fusing point, as in my experience the quicker the gum-enamel is baked the more brilliant the color of the gum becomes. Should the case be left in the fusing muffle and there allowed to cool, the brilliancy of the color of the gum would be bleached out on account of the long heating. It is therefore better to remove it to a muffle of much lower degree of heat and allow it to cool off, which will take from five to seven hours if attached to the furnace proper.

Dr. Custer. You can see now that the temperature in my apparatus is much lower than if it were in a coke oven ; the current is instantly shut off and the heat commences to decrease at that point, decreasing so rapidly that there is no change.

Dr. Walker. Dr. Meyer said that if he allowed a case to remain in his fusing muffle to cool, in time the color bleached out. How does he account for the bleaching ?

Dr. Meyer. After the source of heat is discontinued or shut off, the fusing muffle still retains a high heat for a considerable time, and would decrease so slowly, that if the case is allowed to remain it would result in a stewing process, which is detrimental to enamel color. If Dr. Custer has a case in his furnace and does not remove the plug after turning off the current, I think he would have a similar bleached-out condition of the enamel.

Dr. Hart. I have had but little experience in baking porcelain, but I think Dr. Meyer's conclusions are based upon false premises. If he leaves his case in the old-fashioned muffle he continues to cook it right along, whereas with Dr. Custer's appliance, if I understand it, when the current is shut off the heat is reduced from the fusing point, and the cooling process is reached in so short a time that there is no cooking or bleaching.

Dr. Meyer. Dr. Hart misunderstood my position. I said that after fusing the enamel I remove it from the muffle wherein it was fused and place it in a cooling muffle attached to the outer side of the furnace proper, and there allow it to cool.

Dr. Nash. What would be the temperature of the cooling muffle ?

Dr. Meyer. About three to five hundred degrees ; but when the hot case is placed in it and every crevice is closed, the heat in the chamber will rise greatly.

Dr. Walker. Have you ever taken an accurate observation of the temperature of the muffle ?

Dr. Meyer. No. I believe The S. S. White Dental Manufacturing Co. has, or will have, an instrument by which the degree of temperature will be determined.

Dr. Louis C. Leroy. I think Dr. Custer's method of fusing and cooling will demonstrate itself more fully in the results shown by the case, which is in the oven now. When it has cooled sufficiently we can see whether the color has bleached out.

Dr. Nash. Would it be possible to bring the heat up to the fusing point in less time than you have stated ?

Dr. Custer. It can be brought up in three minutes, if you wish. I have never seen a case of bleaching except where it was overfused. I think it is due to overheating.

Dr. HART. I would like to ask the essayist if he found that this apparatus caused a bleaching of those porcelains which are on the market, if the bodies could not be changed as to color so they would come out with a natural appearance?

Dr. CUSTER. I think so. You can see the results in the specimens I have here.

Dr. WALKER. I do not think we know much about this matter yet. We know something about the old-fashioned way, as presented by Drs. Allen, Meyer, and Close, but not the fusing of porcelain with electricity. Time will prove whether this is superior to the old method. We ought to give Dr. Custer an opportunity to demonstrate further.

Dr. NELSON T. SHIELDS. I have had considerable experience in baking porcelain crowns, using the Downie furnace and Downie porcelain. The only objection to it is the great amount of physical exertion required to operate it, pumping at it vigorously for a few minutes with a bellows, but the result seems to be all that could be desired. In regard to leaving the porcelains in the furnace after fusing, I always leave them in the furnace if I have time, to allow gradual cooling. I can get better results, and the porcelain comes out tougher. The intense heat is stopped when the pumping is discontinued, and begins to diminish, but the cooling process is very slow.

Dr. J. Y. CRAWFORD. I have had no practical experience in baking porcelain, but I wish to thank the gentleman for his contribution to this department of our profession. This system will accomplish more thoroughly what we desire than any process heretofore used. Dr Custer has perfect control in the increase and decrease of the temperature. If he is correct in his statement, and I comprehend it, he can fuse in three minutes, or he will let you designate the time necessary to accomplish the fusing, and he will regulate the instrument to accomplish the fusing of the porcelain in exactly the time that you suggest. Therefore the instrument certainly meets the requirements from every standpoint. I am very much pleased with the exhibit, and with the hope that we will be able to produce, in small quantities, the character of porcelain that we desire for satisfactory inlays in conspicuous cavities on the front surfaces of teeth. None of the porcelain that I have been able to see prepared for small inlays has had sufficient density not to undergo the change which we all have seen. I know Dr. Brown has given a great deal of attention to this subject. Glass, which was at one time suggested, proved a failure in my hands, but I am hopeful that electricity may produce the character of porcelain that will withstand the secretions of the mouth.

Dr. E. PARMLY BROWN. The thing that I have seen done least successfully with porcelain, has been filling or inlaying. Fortunately, in my opinion, it is the least needed. In one case in a thousand I would wish to put in a porcelain filling, but in almost every case I want to use porcelain work for supplying the loss of one, or almost a full set of natural teeth, or for replacing the crown of a natural tooth.

Electricity has come to stay. Fifteen years ago I spent a few days at Edison's laboratory, and I saw him perfecting the incandescent lamp. I came back and wrote an article for the paper, that tells what you have here to-night. Edison showed us then that electricity could produce any amount of heat. You can do anything with heat. You can bake a biscuit with it, or you can bake porcelain. Suppose that heat did do something to the porcelain that you didn't like. Put it in a platinum muffle. We did that with coke and gas. The great trouble in fusing porcelain has been that it was a little too much trouble to the average practitioner. The average dentist is not in his business to do artistic work regardless of everything else.

I expect to work this machine. I know that electricity will do this baking for the dentist of to-day, and for the dental profession of the future. I do not believe that electric heat will bubble porcelain. What Dr. Meyer said was all right, and what Dr. Custer said was right, too. The larger the pieces of porcelain that we bake in continuous-gum work or bridge-work in the old way, the more likely we are to have them bubble inside. Is that not right, Dr. Meyer?

Dr. MEYER. No; it is not.

Dr. BROWN. Well, I am speaking now of the average chances of gassing, not when you do it expertly. It is well known that gassing is a serious thing in regard to all kinds of porcelain. How we can have any gassing with this electricity, I cannot see. If there is any danger, we could have a closed, even an air-tight, platinum muffle with the wires remaining around it. Welding is done by electricity. Some years ago, my electric lamp did not burn, and I thought I would scratch it a little with a pair of shears that I had. I touched it, and the points of those shears were melted together so that they have never been separated. That told at once electrical fusion. If you can do that with a single spark, you can get any heat you want with the proper resistance, as Dr. Custer has done.

The question of baking, as you all know, is a varied one. Expertness and care are required in the work. A man wants to have a high notion of the prosthetic in dentistry to do the work as we have been doing it; but with this electrical apparatus, I think the masses can do porcelain work, and that is what pleases me.

Dr. S. L. CLOSE. It would be a long story to tell of my experience with continuous-gum work, as I have been at it since 186c. I was with Dr. John Allen for ten years, and not only learned the process of fusing porcelain, but also the process of making it. I took up his recipes afterward, and have improved on them, and, as for the enamel, there has not been any of it used in the profession since 1865 under the name of Allen's and Close's, but what is of my manufacture. Dr. Roberts, who was then in Bond street, made some enamel and body, and he made such a quantity of it that it was used for many years afterward. It got scattered about in two or three different depots. In regard to this process of fusing by electricity, it only requires a few minutes to fuse it. I should object to having it stay in the muffle too long subjected to that red heat. That always bleaches out one of the materials that is used in the manufacture of the enamel. Tin is used for the purple color, and the oxid of gold for the red. If you leave it there too long, it will bleach out the purple color, and it will be almost a brick-red. When we first commenced to fuse porcelain, we used to have what we called the best of Lehigh coal. With that we had very little trouble in gassing the pieces. There were two ways in which pieces would be gassed; one came from the sulfur that was in the coal, and the other from the carbon. You might take a piece from the fire when it had been gassed with the carbon, because it would not change color much, but if it were gassed with the sulfur it would have a decided purple color, having more of the tin in it than the gold. In the old Lehigh coal there was less of this material. I have been looking forward to the time when we could have a furnace without the use of coal. About last June, I had a furnace sent to me from Detroit, using oil for fuel. I gave that a very thorough test. I have used it ever since, having abandoned my old furnace for it. I have never gassed a piece with it yet. As far as this electric furnace is concerned, I do not know anything about it. I do not think there would be any gassing.

Subject passed.

Dr. J. Y. CRAWFORD. I have formulated a few thoughts on the care of the teeth of the young, that I want to suggest to this society by way of addition to some valuable contributions that have been made by men in the east, in reference to that subject. Dr. S. G. Perry, of this society, has made some contributions to the literature of this department of our profession, that I appreciate and indorse very fully. There is very little additional to be said. What little we do say ought to be said very carefully, and along a line that will have a tendency to add to the aggregate of what is known to be fact: so when we discuss the pediatrical aspect of our profession we will have data, so that we can establish a technique that will sustain itself, and that will satisfy the most critical. Therefore I will call attention to a clinical feature of the care of children's teeth, in which I claim to have made a little contribution to dental surgery.

It is in the treatment of the pulpless baby teeth, the deciduous or milk teeth upon the side of the mouth,—the molars, not the six front teeth, particularly not the four front teeth, but the teeth on the side of the mouth,—those cases that require treatment as the result of excessive caries, early in life, at the fourth, fifth, and sixth year, before the eruption and adjustment of the first permanent molar above and below. The treatment of pulpless baby teeth at that time of life, is to do as little work as you can on the tooth. Handle it as little as you can. Accomplish the feat of giving relief when the patient first presents, and leaving the parts in an aseptic condition, and after the tooth is made comfortable, fill by medication, using such medicaments as phosphate of zinc mixed with German wood creasote in the canals, if you enter the canals at all; then into the bulbous portion of the pulp-chamber put in a plug of gutta-percha, and over that put a capping of cement. In a few days make an appointment for your little patient, and amputate the tooth, non-antagonize it. The original idea with me, which I insist is a practical one, is to start the process of exfoliation before the coming forward of the first permanent molar and the locking of the dead baby tooth between the tooth in front and the tooth back of it.

One of the principal factors in the retention of baby teeth at the present time, which is becoming more and more common, is that they get locked between the first permanent molar back of them, and some permanent solid tooth in front. The locking is like the locking of the baby eye-tooth in its process of eruption. Why is it that the cuspids have such great difficulty in getting through the gum, to fill up the edentulous space? Why is it that the eye or stomach-tooth has such great difficulty in coming through the gum? From its formation, we would imagine that it would come through more readily than any other, but it comes through more tardily than any one of the twenty baby teeth. It is because not only the baby second molar in the process of development, and frequently in the process of eruption, drives the first baby molar forward and catches the tooth between, but often the first permanent molar becomes a factor also in pushing it forward, and the cuspid is held firmly grasped between the lateral incisor and the first baby molar.

Why is it that all through the country, particularly in the rural districts, where every man is his own doctor, the common idea is that there is greater danger when the child erupts its stomach-tooth, as they call it? It is due to the peculiar conformation of the lower jaw, and the character of tissues beyond and back of the teeth. The tendency is to drive them forward, the same reason that drives the tooth forward as a result of premature extraction of the baby tooth.

Here is another little idea that I have in the treatment and filling of those teeth. I mention these things merely as little additions to anything that is known on the subject. In our section of the country sometimes we have at three years of age well-developed cavities in baby teeth. We have simple cavities, we have compound cavities involving the approximal surface, and we have compound complicated cavities. A simple cavity is a hole on the front or back surface; a compound cavity involves the grinding surface; a compound complicated cavity is one that not only involves the grinding-surface, but extends under the gum. In a child of three, four, or five years of age, with compound cavities on the approximal surface, I have suggested to some of my friends to overcome the difficulty resulting from the ordinary way of filling those teeth, particularly if we use a file in separating, letting the first permanent molar come forward,—just to prepare the cavities nicely, and be sure to give them a good shape to hold the plug firm; take a little ribbon of rubber-dam, cut it a quarter of an inch wide and fold it as you would a bit of rubber for wedging, and let it pass beyond the approximal cavity; then take a piece of platinum wire and cut it long enough to pass from one cavity to the other. Jag and barb the piece of wire to make it hold well. Mix up a good cement. Insulate the bottom, if you think it necessary, with a bit of gutta-percha. Fill in your cement in those cavities, and drop in the piece of platinum wire to bridge across. About the time the cement is hard, establish as nearly as possible a normal condition of things, by trimming up the fillings well to bring out good interdental spaces to prevent the packing of food, that is so annoying in connection with that class of cavities.

If I used amalgam at all in the practice of dental surgery,—if I believed it to be right,—that is one place where I would use it; but believing that it is an abomination, and that it has done more harm than good, and will finally get into disrepute, and believing that I can save the same teeth with two or three other better things, I would rather use the cement, and renew it every year, than put in an inferior metal between them.

This question of the care of the first set of teeth,—the pediatrical part of our profession,—is the most important one that suggests itself to us to-day. I would like the younger members of our profession to institute a careful series of clinical investigations, proving or disproving some theories in reference to this matter. The teeth of the children in our country are growing worse from generation to generation. I realize I am talking to gentlemen who have a clientele that does not give them, outside of what they get in the literature of our profession, a clear insight into the condition of the teeth of the common people of this country. I had some friends observe a number of patients that I brought into my office, and our very noted and distinguished friend Dr. Taft, of Cincinnati, said, "Have you any more cases like this?" I said, "Yes, the country is full of them." He answered, "Why, what is the matter?" I said, "We have a climate, we have a condition of things that favors the development of diseases of the mouth." People have not utilized the advantages of applying care to children's teeth. They have been getting worse, and perceptibly worse, in my short experience. Something must be done. I am one of those who look at the question of dentistry from a humane standpoint. I look at it from the standpoint of a public necessity. I look at it for the benefit of our whole people. I want to see my profession wake up on the care of the teeth of children and young people.

I respectfully call attention to the little suggestion that I have made in reference to the supplementing of the non-absorption of the root of pulpless baby teeth by the process of non-antagonizing. I did not finish all I had to say about it. Do not think if you non-antagonize it once, that will do away with everything else. The process of exfoliation will bring the teeth together again. Keep on cutting off from time to time until you get to the bifurcation of the root, and you have done away with the necessity of extracting a baby molar.

Another strange thing about this: sometimes the loss of these baby molars on the side will result in the premature eruption of the bicuspid, while in other cases the premature loss of them will retard the eruption of the bicuspid. Take two typical cases to illustrate the idea. One child is the subject of carelessness on the part of the parents, and the other the subject of a want of interest as to its welfare, physical or otherwise. The little fellow's baby tooth becomes diseased to such an extent that the pulp becomes exposed, and an abscess follows, with the establishment of a fistulous opening. Not only that, no care has been given, and that fistulous opening gives a permanent artificial opening into the crypt in which the bicuspid is being developed. Extract the baby molar prematurely, and if that artificial opening is sufficient and does not close, the permanent tooth, the bicuspid, will gravitate through that hole in advance of its time. Take a patient of the same age with an ordinary toothache, where simply the pulp is involved, and there is no inflammation around the root. Nature fills up the socket, the blood becomes a good sponge-graft, and it goes to healing at once, with no destruction of bone, and in that case the permanent tooth will become encysted.

The prominence of two central teeth,—teeth that we call sometimes in the country "butter teeth,"—is sometimes caused by the teeth gravitating through before their time. We do not want such conditions as that to arise. We do not want to extract the tooth too early, to let the bicuspid come in too soon. We want to keep it there, and there is no better way of doing it than to treat it as I have suggested. Keep on cutting it to the bifurcation of the root, and it can be taken out a little at a time, and you avoid the pain that prejudices the child against further dental operations.

There is another point to which I want to call attention. Talking about the troubles of the human family, from any standpoint, I always want to know what caused it. I believe that one of the prominent etiological factors in the production of the condition of things seen in the teeth of the children of our country, is our faulty system of education,—the wrong conception that our people have in reference to education. I candidly believe that every dollar of money that is expended by the American people, either in public or in private schools, for the education of our children under ten years of age, is not only money thrown away, but I believe that the expending of the money is accompanied by an injury to those who are under our care and for whom we are responsible.

Mr. Chairman and gentlemen, if I cannot prove from an anatomical and physiological standpoint that the child from six to twelve years of age is comparatively as much incapacitated to perform the function of mastication as the half-edentulous grown person, then I will quit my profession. If the function of masticating the food and preparing it for the stomach is as important as we dentists think it is, and claim that it is, if by careful investigation of this question we can prove that the child, in proportion to the demands in the individual case, is incapacitated to perform the work of mastication in proportion to the deficiency exhibited in the half-edentulous grown person, I think I can win the case. I believe that is so. Why do I say that? You are all familiar with the fact that at the third year, the process of root-absorption of the deciduous teeth commences, and that the enlargement of the crypt in which the permanent tooth is to be built moves on in proportion with the removal of the baby tooth, and before long the baby teeth have the apical ends of those roots opened into the crypt, at which time nearly every child changes from a solid to a semi-solid diet. He will want to leave off eating hard food, and ask his nurse to give him soup. To put a child to school when he is thus incapacitated, to put him to hard physical and mental labor at that time—no wonder we have an increased number of cases of Pott's disease and other affections. The average child has more books than many a person of twenty-one years of age can master.

While in this incapacitated state, the child is given a course of study that would tax an older person, and he is kept at it from six to eighteen years of age. I believe that it can be proven, from a high scientific standpoint, from a standpoint of political economy, from a physiological standpoint, that the length of time that ought to be occupied in the education of the masses of this or any other free country, is six years, and those six years ought to be from twelve to eighteen.

I have one more duty to perform, in calling attention to the meeting of the American Dental Association at Asbury Park next August. I hope to see a liberal representation from all the societies of this country, and particularly a full representation from the dental organizations of the state of New York. You have your state society, and your local societies all over the state. I have a list of them, and I am making a list to furnish the corresponding secretary of the American Dental Association, of all the dental organizations in this country, asking them to appoint members who can become new members of the American Dental Association. All dental colleges in good standing, and all dental societies, are entitled to one representative for every five members. I hope the officials will take cognizance of this matter. Please be careful and do not appoint those who are now members of the association. They have a voice and a right to go to the meetings anyhow. Appoint the younger members. We want to get a large attendance of the better element of the profession, but we are particularly interested in bringing out the younger element in the profession.

There has been recently put on foot a movement to bring about a combination of the two national organizations,—the Southern Dental Association and the American Dental Association. A committee has been appointed for that purpose, and they are investigating the matter. Nobody is pushing it, but we are simply talking about it. No formal or definite action can be taken, because the Southern Dental Association must be a party to that, and it will not have a meeting previous to the meeting of the American Dental Association. The question will be discussed and looked into. In addition to that, the National Board of Dental Examiners will meet at that time and place. The subject of dental legislation is of much more importance than the profession generally think,—the maintenance of our laws in the various states of the Union. The College Faculty Association meets in connection with the American Dental Association. Dental education has done more than any one thing. It is important for the whole profession to be familiar with that work.

Finally, I want to say, as the presiding officer of the American Dental Association, I am determined to have a regular delegation there to carry on business in conformity with the by-laws and constitution of that association, and to do something toward the development of the idea that, even if the Southern Association does not come in, we will make the American Dental Association thoroughly and genuinely not only in name, but practically the society that shall pass upon all questions of ethics and other questions that should be adjudicated by the whole profession.

The society extended a very cordial vote of thanks to Drs. Custer and Crawford for their valuable contributions.

Adjourned. B. C. NASH, *Secretary.*

## ACADEMY OF STOMATOLOGY.

REGULAR meeting of the Academy held March 12, 1895.

Dr. HARRISON ALLEN read a paper entitled "Diseases of the Maxillary Sinus," which is printed in full at page 427 of the current number.

### *Discussion.*

Dr. C. J. ESSIG. I have had very little experience in the treatment of diseases of the maxillary sinus. Within the last two or three years I have had two cases of some interest. One was a gentleman, the origin of whose trouble I knew nothing about. He came to me from a professional friend in New York, who had commenced treatment, and had removed the first molar, made an opening into the sinus, and had introduced a silver tube. The discharge in the case was very copious, indeed.

When the gentleman came to Philadelphia to reside, he found some difficulty in continuing the treatment. He would be sometimes three days in Philadelphia, and then absent for three months, and during that time the sinus was not irrigated or washed out, and the remedy was not applied. I found he was not only intelligent, but quite handy in the use of instruments, and I obtained for him one of the little india-rubber syringes with a metallic point, such as we use every day in our practice, and he took with him some Seiler's tablets, and with one of these dissolved in water, by the assistance of the little syringe, the sinus was washed every day. When he was in Philadelphia he would come to see me, and I occasionally removed the tube and renewed the ligatures, attached to neighboring teeth. Finally he was absent for three months, and when he came back I found the tube had been removed, the fistula had closed, and the sinus was quite well. There was no great difficulty in producing a cure as long as he could receive proper treatment.

Another case which came to my notice very recently was the result of an alveolar abscess of the first molar, which had been supplied with a Richmond crown. In that case I felt very anxious, and was very much afraid the patient was going to have a serious time with the maxillary sinus. As she was confined to the house I went to see her, and at the end of five days the abscess was ready to be opened, after which the trouble subsided and the patient is now quite well. The discharge from the maxillary sinus into the nasal cavity and the mouth was quite large. After one of the visits, I had gone down into the hall ; she made some remark that arrested my steps before I reached the door, and I found her leaning over the banister. She said, "Just as I spoke to you a large amount of fluid seems to have run out of my nose." Of course, I felt anxious about the case, and thought that if within a few days the symptoms did not subside it would be necessary to remove the first molar and establish an opening, but I found that after the abscess was opened the swelling disappeared, the soreness subsided, and there was no further discharge or trouble with the maxillary sinus.

I had gotten the idea, probably from Dr. Gross's teaching or from his System of Surgery, that cases of trouble in the maxillary sinus were not only exceedingly serious, but very apt to take on a malignant character, and I was very much afraid that the latter case would not get well without further treatment, perhaps surgical treatment other than removal of the tooth and opening into the sinus ; but I was very much gratified to learn that all the symptoms had disappeared, and the sinus was quite well without any further treatment.

My experience in these cases has been so limited that I have often thought it curious that in my more than twenty years of active practice I have met with but those two cases of trouble in the maxillary sinus. I do not hesitate to say that they are exceedingly rare, in our practice at any rate ; I know of no other than the two I have mentioned in all that time, out of a fairly large practice, where I have found any trouble, or where it was necessary to treat the sinus. I know of no patient who has gone into the hands of a general practitioner or surgeon.

I would be very glad to hear from other members of the profession as to the proportion of cases of this character.

Dr. M. H. CRYER. It gives me the greatest pleasure to have had this opportunity of listening to Dr. Allen, not only for the knowledge I have received this evening, but also because he was my first teacher of the anatomy and surgery of the maxillary bones. He was also the first one whom I saw use an engine for bone-surgery; this was while I was a student, somewhere in 1875.

It has been my very great pleasure to see Dr. Allen operate on the superior maxillary bones and their associates many times, and I am indebted to him for a great part of whatever knowledge of the subject I may possess. I have a case now that may be interesting, as I have been unable to arrest the flow of pus. The patient came to me about two months ago. The first molar had been extracted, and the parts appeared to be in a healthy condition; but when the mouth was thrown widely open, the pus would exude from where the tooth had been extracted, and in opening and closing the mouth frequently it appeared as though the action of the muscles pumped the pus out. The posterior wall of the antrum had broken down by caries or other process. In treating this antrum by different fluids, using peroxid of hydrogen, it was impossible to get any of the fluid forced into the nasal chamber, from which I concluded that that opening between the antrum and nasal cavity was closed; it was difficult to syringe the antrum from the small opening. Thinking it best to open it wider, the second molar was extracted, and by the use of a small surgical bur the opening was made so that a syringe of considerable size could be used, and the cavity might be flooded or irrigated. It responded to treatment for a short time fairly well, but I noticed to-night there was still pus in the cavity, the patient not having had it washed during the last two days. You can see a pulsation at the opening.

Dr. GLEASON. My experience has been very limited in diseases of the maxillary sinus, so that it hardly seems worth while for me to say anything about it. I think I have had only five cases; I cannot remember more than that number. Of that number, three were from causes outside of diseased teeth. If I am not mistaken, Dr. Bosworth, the well-known writer upon such diseases, states that diseased teeth are regarded as mostly the cause of diseases of the maxillary sinus; yet rhinologists will take a different view of the subject, and consider that diseases of the maxillary sinus are more often of intra-nasal origin.

In the first of these cases that came under my observation, the trouble was acute in its nature, being the result of a cold; a rheumatic individual had caught a cold and got well inside of ten days; at least it was not over two weeks before the symptoms of the disease of the maxillary sinus ceased.

In the second of the cases that came under my observation, the disease was apparently the result of nasal polypus. The lady had been manifesting symptoms of empyema of the parts from time to time. In the mean time she consulted her dentist, and during that time the disease of the maxillary sinus developed apparently, and was treated by the dentist, but not cured at the time I saw her.

In the third of the cases, the anterior turbinated bone had been lost as a result of syphilis, so that it was possible to look from the nose into the maxillary sinus and see what came from it. During one or two attacks of cold the mucous membrane lining the antrum became very much congested; it lasted for a length of time and finally subsided. On another occasion, inflammation of the sinus was followed by a somewhat copious discharge of sero-pus.

In the third and fourth of these cases, the trouble resulted from the disease of the incisors, and involved the bone above, so that the maxillary bone became necrosed, and it was the result of the extension of the inflammation of the sinus. The right side was involved, and there was purulent inflammation of the cavity. A temporary relief of the affection was brought about somewhat promptly by washing it with peroxid of hydrogen, a fifteen-volume solution, and afterward following that up with a four-grain solution of silver nitrate to the ounce of water. A solution of silver of that strength is so strong that it will often irritate the mucous membrane greatly if care is not taken, so that before washing the nasal parts I was in the habit of packing the posterior nares, which keeps the nitrate of silver from passing through the nose into the pharynx. There were one or two relapses, however, in this case, but an ultimate cure of the affection was brought about.

Dr. CURRY related the following incident:

I would like to ask Dr. Allen's opinion of a case I had. It was during the second week after I graduated. I had located in a rural district. An old lady, of about sixty years of age, called and said she had something the matter with her gums, and wanted me to look at them. There were no teeth from the cuspid back, and the alveolar process looked as if the teeth had been absent for years; but she insisted there were some roots there, and that they hurt her.

I took a lancet and passed it through the gum into the antrum. There seemed to be no bony tissue at all, but there was a discharge of the most offensive pus that I ever smelled. I treated her, and before the end of the second week she came in and complained very much of the other side of the face, which was quite swollen. I opened that up in the same manner and got it in better shape, but it was three months before the parts healed.

I would like to ask how Dr. Allen would assign this case in the five classes. I was not able to locate the cause, unless it had been from catarrhal trouble. She had been treated some years before for catarrh. I saw her several months afterward, and there was no discharge.

Dr. E. T. DARBY. Dr. Allen said that these diseases are more common than we imagine. After that remark I recalled the instance of a surgeon of this city who has called upon me twice if not three times during the past twenty years, to have me examine the teeth carefully under the antrum to ascertain whether there was any dental cause which could give rise to abscess of the sinus. I found on each occasion that the teeth were perfectly sound, and I had no reason to believe that the condition came from the teeth. It came each time after a severe cold and catarrhal inflammation, and he complained not only of great fullness in the mucous passages of the head and masticatory muscles, but also of a discharge when lying on the left side, a discharge from the nostril; from this he suffered a good deal of pain.

In a few weeks after the catarrhal condition passed away, the pain passed away, and he had no return of it until another violent cold. I have seen him three times in twenty years with just that condition, so I presume there is a catarrhal condition of the membrane lining the antrum, which is not dissimilar from that which we have in the nasal passages.

Dr. ALLEN. The discussion has been very instructive, and several points have been brought forward which are new to me. I have not had the experience that Dr. Gleason gives. I presume from what Dr. Darby said that he has recognized this transmission of irritation from the nasal chamber to the nose in a form by which he was enabled to diagnose the inflammation of the sinus. It only goes to show how narrow one's experience is. I have, and I suppose all of us have, cases come to us, and then they will go away and we will never see anything of them. In the order of causes I should say that dental causes are more frequent than others ; Dr. Gleason would evidently not agree with me there. Of course, I give my conclusions only from my own experience. For my own part, I would not make a diagnosis without illumination.

The case of the old lady is entirely new to me. I have seen plenty of cases in which the bones were so thin that the lancet would have gone through the slight barrier between the gum line and the anterior sinus, but for an old person to have symmetrical antral pyemia is a very interesting case, and the opening with the lancet is, I believe, unique. I think the case ought to be reported.

Dr. Essig states that he has had but three cases in a practice of twenty years. I think a post-mortem examination would show that it occurs more frequently. In the University of Pennsylvania I took all the refuse of the dissecting-room, and had the heads separated and prepared for study. They were macerated and afterward boiled, and out of twenty-five cases I found two in which there was a cheesy appearance of the maxillary sinus, which, in that proportion, would be eight in a hundred. Now, it is probable that in the poorer classes we may see it more than in the well-to-do classes. The cases are perhaps not so apt to be found in a private practice as in the dissecting-room.

Dr. ESSIG. Dr. Allen's suggestion that cases of that kind are not so likely to be seen in private practice as in a dissecting-room is probably true. I think a dental practice among the better class of people that is kept well in hand is not the very best place to observe other than our ordinary dental operations.

Some time ago, to illustrate, I wanted two or three models of Hutchinson's teeth. I had not seen a Hutchinson tooth in my own practice in twenty years, and I had to ask Dr. S. D. Risley to look out for them among his clinical patients. In the course of a few days he was able to send me a number of little patients with typical Hutchinson teeth, and I was able to get an impression of them, so that I got quite a collection. In my own practice I would never have been able to have gotten any.

As to these cases of antrum trouble, if I were asked, I should say they were exceedingly rare.

Dr. BURCHARD. In all the text-books, including that of Dr. Allen, in the description of the antrum it is said that the roots of the molars frequently perforate its floor. I want to know whether there can be any accurate anatomical description given of the covering of the apex of the root? That is, have preparations been made, showing the histological relations of the root-covering in such cases?

Dr. ALLEN. I do not know.

Dr. BURCHARD. In using peroxid of hydrogen for irrigation, I have neutralized its acidity with peroxid of sodium. It may be alkalinized in that way, and at the same time the volume of oxygen increased.

Dr. ALLEN. I am glad to know that.

Dr. GLEASON. My experience has hardly been sufficient to base a rule of practice upon, but Dr. Cryer has some cases at present, and he can give more information on the subject.

Dr. JACK stated that in his experience of forty-one years he had had but one case, and with that Dr. Allen was familiar.

Dr. CRYER stated in reply to Dr. Gleason that the cases he has in hand at the hospital are cases coming from different parts of the state, and outside of the state, and that it is not a fair basis for an average. At present there are three reporting to the hospital with antrum troubles.

Meeting adjourned.

GEO. D. B. DARBY, *Secretary.*

## HARVARD ODONTOLOGICAL SOCIETY.

THE seventeenth annual meeting of the Harvard Odontological Society was held at Young's Hotel, Boston, February 23, 1895, at five o'clock; the president, Forrest G. Eddy, D.M.D., of Providence, in the chair.

Reports were made by the recording and corresponding secretaries, treasurer, and chairman of the committee on clinics.

This committee was appointed last March as an experiment, but since that time it has thoroughly demonstrated its usefulness, and has now become an important department of the society. Six clinics have been given, five by members of the society.

The recording secretary reported the number of active members as forty-four, and the corresponding as thirteen.

The society has held ten meetings during the past year, nine regular and one annual. Eleven essays have been presented, of which eight were contributed by members of the society, on the following subjects:

"Some Observations in the Extraction of Teeth as a Preventive of Decay;" "Some Details as to the Care of Dental Instruments;" "Gutta-percha;" "The Care of Deciduous Teeth;" "A Consideration of some of the Problems in a Dentist's Life;" "Some Disturbances caused by Diseases of the Teeth;" "Educational Aspect of Athletics;" "Localized Neuritis;" "Semi-Centennial of the Discovery of Anesthetics;" "Dentistry in the Public Schools;" "Alteratives."

The December meeting was entirely devoted to the celebration above referred to, and all members of the alumni were invited to be present; many accepted the invitation, and the occasion was most enjoyable.

An innovation was introduced this year by making the annual meeting "ladies' night," and the response called out by the invitation was very gratifying. After a social half-hour an adjournment was made to the banquet hall, where forty-nine members and friends assembled. At the close of the dinner the orator of the evening, Wm. P. Cooke, D.M.D., of Boston, closely held the attention of his hearers, taking as his theme "The Dentist as a Man."

The standard set by the orator was a high but not impracticable one. The dentist should broaden himself by liberal education, seeking to train his whole mind just as the athlete does his whole body. The possibilities of the profession are great, and the value of the work is in proportion to the service rendered.

A letter of regret from Professor Francis G. Peabody, D.D., of Cambridge, was read, and also one from Rev. W. E. Huntington, Ph.D., dean, Boston University.

Interesting addresses were made by Mrs. Mary A. Livermore, Rev. W. B. Eddy, and John T. Codman, D.M.D.

The following officers were elected for the ensuing year; James Shepherd, D.M.D., president; Waldo E. Boardman, D.M.D., recording secretary; E. B. Hitchcock, D.M.D., corresponding secretary; Dwight M. Clapp, D.M.D., treasurer; Henry L. Upham, D.M.D., editor; Waldo E. Boardman, D.M.D. (chairman), Arthur H. Stoddard, D.M.D., J. G. W. Werner, D.M.D., executive committee; Edward S. Niles, D.M.D., orator for 1896.

JAMES SHEPHERD, *Cor. Sec.*

## VERMONT STATE DENTAL SOCIETY.

AT the nineteenth annual meeting of the Vermont State Dental Society, held at Brandon, Vt., March 20 to 22, 1895, the following officers were elected for the ensuing year:

Dr. E. O. Blanchard, West Randolph, president; Dr. F. P. Mather, Chester, first vice-president; Dr. C. S. Campbell, St. Albans, second vice-president; Dr. T. Mound, Rutland, secretary; Dr. W. H. Munsell, Wells River, treasurer; Drs. J. A. Robinson, Morrisville; K. L. Cleaver, Montpelier; H. Turrill, Rutland, executive committee. State prosecutor, Dr. G. W. Hoffman, White River Junction.

Resolutions upon the death of Dr. L. Gilman, of St. Albans, a prominent member of the society, were presented and passed.

Next meeting to be held at Montreal, third Wednesday in March, 1896.

THOMAS MOUND, *Secretary*,
Rutland, Vt.

## WOMEN'S DENTAL ASSOCIATION OF THE UNITED STATES.

THE third annual meeting of the Women's Dental Association was held at the office of Dr. Mary H. Stilwell, 1300 Arch street, Philadelphia, Saturday evening, March 2, 1895.

The following officers were elected for the ensuing year: Dr. Anna T. Focht, president; Dr. Elizabeth A. Davis, vice-president; Dr. Emily W. Wyeth, recording secretary; Dr. Mary H. Stilwell, corresponding secretary; Dr. Matilda Groth, treasurer; Drs. Eliza Yerkes, Bertha Jarret, Maria Lasser, Hannah M. Miller, and Martha C. Corkhill, executive committee.

Vice-presidents from representative states were re-elected.

Total membership forty-two.

EMILY W. WYETH, *Recording Secretary*,
3920 Fairmount ave., Philadelphia, Pa.

## EASTERN ILLINOIS DENTAL ASSOCIATION.

THE Eastern Illinois Dental Association met at Urbana, Ill., February 27 to 29, 1895. A very interesting meeting was had, and about forty members were present.

The next meeting will be at Decatur, Ill., on the third Tuesday of March, 1896.

The officers elected were as follows: W. W. Tobey, Danville, president; I. A. Lumpkin, Mattoon, vice-president; F. M. Conkey, Homer, secretary; S. A. Cambell, Mattoon, treasurer; S. A. Waltz, Decatur, supervisor of clinics.

F. M. CONKEY, *Secretary*.

## ALUMNI SOCIETY OF THE PHILADELPHIA DENTAL COLLEGE.

THE annual meeting of the Alumni Society of the Philadelphia Dental College was held on Thursday, March 7, 1895, at 3 o'clock P.M.

The following officers were elected:

Dr. H. McManus, president; Dr. W. Harrower, vice-president; Dr. S. H. Guilford, treasurer; Dr. L. Greenbaum, recording secretary; Dr. M. Lasser, corresponding secretary.

LEO GREENBAUM, *Secretary*.

## ALUMNI MEETING, BALTIMORE COLLEGE OF DENTAL SURGERY.

THE alumni meeting of the Baltimore College of Dental Surgery was held in the college building, Thursday, March 21, 1895. The following officers were elected for 1895 and 1896:

Charles A. Meeker, D.D.S., Newark, N. J., president; Edward Nelson, D.D.S., Frederick, Md., vice-president; W. W. Dunbracco, D.D.S., Baltimore, Md., secretary; T. Sollers Waters, D.D.S., Baltimore, Md., treasurer.

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# DENTAL COLLEGE COMMENCEMENTS.

## WESTERN DENTAL COLLEGE OF KANSAS CITY.

THE fifth annual commencement exercises of the Western Dental College of Kansas City were held at the Auditorium, Kansas City, Mo., on Tuesday evening, March 5, 1895.

The annual address was delivered by Hon. Webster Davis, the faculty address by Dr. A. M. Wilson, and the valedictory by F. G. Worthly, D.D.S.

The number of matriculates for the session was one hundred and sixty-three.

The degree of D.D.S. was conferred on the following graduates by the dean, Dr. D. J. McMillen :

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| Mrs. A. Baum | Kansas. | R. W. Hood | Nebraska. |
| L. A. Biggs | Missouri. | Wm. A. Hazlett | Missouri. |
| W. D. Bonfils | Missouri. | Isaac Lesher | Kansas. |
| Oscar Bruce | Kansas. | J. F. McClure | Missouri. |
| R. M. Burgess | Missouri. | R. D. McIntosh | Missouri. |
| Charles W. Corel | Missouri. | Tom D. McGowen | Missouri. |
| J. E. Chastain | Kansas. | L. M. Moore | Kansas. |
| E. W. Clark | Missouri. | E. E. McCarty | Kansas. |
| Alfred Daughaday | Missouri. | R. L. Ready | Missouri. |
| B. D. Gamble | Kansas. | T. A. Sims | Indian Ty. |
| A. Gihl | Missouri. | C. C. Thomas | Missouri. |
| E. H. Henry | Kansas. | W. J. Tinker | Missouri. |
| T. H. Howell | Indian Ty. | B. L. Thorp | Missouri. |
| G. A. Hartley | Kansas. | F. G. Worthly | Missouri. |
| W. N. Hall | Missouri. | Irving Woolsey | Kansas. |

## UNIVERSITY OF MARYLAND—DENTAL DEPARTMENT.

THE annual commencement exercises of the Dental Department of the University of Maryland were held at the Academy of Music, Baltimore, Md., on Friday afternoon, March 29, 1895, at 3 o'clock.

The annual address was delivered by Rev. Dr. C. Herbert Richardson, and the class oration by D. Edward Hoag, D.D.S.

The number of matriculates for the session was one hundred and eighty.

The degree of D.D.S. was conferred on the following graduates by Hon. John P. Poe, attorney-general of Maryland :

| NAME. | STATE OR COUNTRY. | NAME. | STATE OR COUNTRY. |
|---|---|---|---|
| W. C. Arthur | Pennsylvania. | G. H. Lyndon | Ohio. |
| W. B. Ashbrook | Pennsylvania. | A. N. McKeever | West Virginia. |
| H. C. Baker | West Virginia. | G. C. Mann | Virginia. |
| L. O Bartlett | Cuba. | C. F. Matthews | California. |
| N. G. Bowbeer | Canada. | E. H. Markley | Pennsylvania. |
| L. D. Blackwelder | Pennsylvania. | F. L. Parker | South Carolina. |
| A. L. Bumgarner | Pennsylvania. | R. W. Palmer | Virginia. |
| W. J. Carter | Georgia. | D. H. R. Patton | Nebraska. |
| W. W. Cavers | New York. | J. A. Rawlinson | Brazil, S. A. |
| B. F. Copp | Colorado. | S. C. Reynolds | Canada. |
| J. C. Criswell | Pennsylvania. | B. F. H. Rouse | Maryland. |
| J. M. Fleming, Jr | North Carolina. | L. St. C. Saunders | Nova Scotia. |
| J. S. Geiser | Pennsylvania. | D. Smithers | Maryland. |
| T. O. Heatwole | Virginia. | G. E. Starr | Maryland. |
| H. C. Henderson | North Carolina. | J. A. Stults | New Jersey. |
| D. E. Hoag | New York. | E. A. Tigner | Georgia. |
| J. S. Hegner | Switzerland. | G. S. Tigner | Georgia. |
| J. H. Ihrie | North Carolina. | N. McK. Wilson | Maryland. |
| S. J. Irvine | Texas. | C. A. Ward | Ohio. |
| G. F. Jernigan | Texas. | G. N. Ward | New York. |
| B. Kritchevsky | Russia. | M. E. Williams | New York. |
| W. H. Kuich | Pennsylvania. | S. H. Wolf | Pennsylvania. |
| C. W. Link | West Virginia. | | |

## OHIO COLLEGE OF DENTAL SURGERY.

THE forty-ninth annual commencement exercises of the Ohio College of Dental Surgery (Department of Dentistry of the University of Cincinnati) were held in the Auditorium of the Odd Fellows' Temple, Cincinnati, Ohio, on Tuesday, April 2, 1895, at 8 o'clock P.M.

The annual address was delivered by Dr. W. O. Thompson, president of Miami University, and the class oration by Charles E. Fitzpatrick, D.D.S.

The number of matriculates for the session was one hundred and eighty-nine.

The degree of D.D.S. was conferred on the following graduates by James Leslie, D.D.S., of the board of trustees:

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| F. P. Anshutz | Indiana. | C. C. Leming | Indiana. |
| W. G. Baker | New York. | E. Matthews | Kentucky. |
| C. H. Barlow | Ohio. | F. E. McGilliard | Ohio. |
| A. P. Bell | Ohio. | C. P. McLaughlin | Indiana. |
| E. M. Bevard | Ohio. | A. J. Myers | Indiana. |
| H. J. Bond | Pennsylvania. | J. N. Myers | Ohio. |
| J. W. Bond | Indiana. | C. M. Meade | Indiana. |
| W. C. Bowyer | Ohio. | O. Miesse | Ohio. |
| A. B. Boyd | Kentucky. | T. S. Noble, Jr. | Ohio. |
| H. H. Braxtan | Indiana. | W. H. Rogers | Ohio. |
| J. A. Calhoun | Ohio. | M. J. Ruddy | Kansas. |
| A. P. Chambers | Ohio. | C. A. Porter | Indiana. |
| A. H. Clancey | Ohio. | E. Shaw | Ohio. |
| F. A. Couch | West Virginia. | R. A. Sprake | Kentucky. |
| E. M. Davis | Pennsylvania. | J. V. Stahl | Ohio. |
| C. O. Edwards | Indiana. | L. Stern | Ohio. |
| H. D. Finney | Pennsylvania. | H. H. Stevenson | Minnesota. |
| C. E. Fitzpatrick | Ohio. | T. Storey | Canada. |
| J. E. Froendhoff | Ohio. | F. J. Tarrant | New York. |
| H. Gillham | Kentucky. | F. S. Taylor | Ohio. |
| W. Gillham | Kentucky. | W. J. Thomas | Pennsylvania. |
| J. B. Griffiths | Ohio. | G. D. Thorne | New York. |
| W. P. Huston | Ohio. | C. D. Van Houten | Ohio. |
| W. H. Johnson | Ohio. | A. S. Woodrow | Ohio. |
| D. P. Jones | Ohio. | R. L. Walsh | California. |

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## WESTERN RESERVE UNIVERSITY—DENTAL DEPARTMENT.

THE annual commencement exercises of the Dental Department of the Western Reserve University were held at Association Hall, Cleveland, Ohio, on Tuesday, March 5, 1895.

The annual address was delivered by Charles F. Thwing, D.D., president of the faculty.

The number of matriculates for the session was fifty-three.

The degree of D.D.S. was conferred on the following graduates:

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| Frank H. Acker | Ohio. | William W. Sherman | Ohio. |
| Leonard L. Bleasdale | Ohio. | Franklin J. Spargur | New York. |
| Allyn P. Buchtel | Ohio. | David R. Stevenson | Ohio. |
| Jay H. Burrows | Ohio. | Richard A. Suhr | Ohio. |
| John W. Glas | Pennsylvania. | Louis S. Vinez | Ohio. |
| Geo. A. Kennedy | Indiana. | Robert D. Wallace | Ohio. |
| Dudley E. Mollen | Ohio. | George N. Wasser | Pennsylvania. |
| Percy O. Parsons | Ohio. | Henry J. Zoeckler | Ohio. |
| James J. Rosensteel | Ohio. | | |

## ROYAL COLLEGE OF DENTAL SURGEONS OF ONTARIO.

For the session of 1894–95 the students in attendance were: Freshmen, 50; juniors, 40; seniors, 45; total, 135. The following passed the senior examination and were admitted Licentiates of Dental Surgery:

J. C. Bansley.
W. C. Brown.
W. J. Bruce.
H. F. Burgess.
C. Bowerman.
W. Bell.
W. J. Brownlee.
C. W. Corrigan.
W. B. Cavanagh.
I. P. Cunningham.
L. H. Dawson.
George Emmett.
E. W. Falconer.
E. Fitzpatrick.
J. A. Fleming.
William C. Gowan.
William F. Ganton.
Richard Graham.
W. T. Griffin.
William S. Hall.
A. Irwin.
Fred. W. Ivory.
William C. Kennedy.
C. B. Lillie.
R. A. Marquis.
W. H. Mosley.
A. E. Mullin.
R. G. McLean.
T. E. Oliver.
E. W. Oliver.
K. Peaker.
J. P. Raleigh.
J. F. Ross.
H. C. Skinner.
N. Schnarr.
W. W. Thornton.
J. N. Wood.
A. J. Wyckoff.
F. Walters.
H. Wightman.
R. A. Willmott.

All of the province of Ontario, Canada.
No formal commencement is held.

## CINCINNATI COLLEGE OF DENTAL SURGERY.

The annual commencement exercises of the Cincinnati College of Dental Surgery were held at the Y. M. C. A. building, Sinton Hall, Cincinnati, Ohio, on Thursday evening, April 4, 1895.

An address was made by Professor G. S. Junkerman, M.D., D.D.S., and the valedictory was delivered by Mr. William Howard Neff.

The number of matriculates for the session was twenty-six.

The degree of D.D.S. was conferred on the following graduates by Francis B. James, LL.B., president of the board of trustees: Andrew J. Bradford, William H. Gensley, William Lockman, Jr., William C. McCormick, and Walter L. Stevenson, all of Ohio.

# DENTAL SOCIETY ANNOUNCEMENTS.

## NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

It is earnestly requested of the presiding officers or secretaries of the examining boards throughout the states and territories that they kindly forward to the national secretary the full list of officers, with their respective addresses.

In view of the large meeting expected at Asbury Park this coming August, the secretary desires to give every board due notice in ample time, and likewise obtain a corrected list of the officers to date.

Charles A. Meeker, D.D.S., *Secretary*,
29 Fulton street, Newark, N. J.

## TRI-STATE MEETING.

THE Russell House, Detroit, which will be headquarters for the Tri-State Meeting to be held June 18, 19, 20, has made a rate of $2.50 to $3.00 per day, according to location of room. The Hotel Normandie, an excellent house, just one block from the Russell, has made a rate of $2.00 to $2.50, according to room. Dr. W. C. Barrett, of Buffalo, will give a lantern lecture one evening during the meeting. Dr. Barrett has duplicates of the bacteriological slides of Professor Miller, of Berlin, and those of Dr. R. R. Andrews on enamel formation. Dr. Hollingsworth, of Kansas City, will be present to demonstrate his system of crown- and bridge-work. Railroad rates will be announced in the June numbers of the dental journals.

G. E. HUNT, *Secretary.*

## ERIE SOCIETY OF DENTISTS.

A LOCAL dental association has been organized at Erie, Pa., to be known as the "Erie Society of Dentists." The membership embraces every leading practitioner in the city. Its regular meetings will be held the first Monday evening of each month, and all reputable practitioners are cordially invited to attend. The officers are: Dr. W. E. Magill, president; Dr. L. Essick, vice-president; Dr. F. C. Callaghan, secretary; Dr. B. D. Schlandecker, treasurer.

## AMERICAN ACADEMY OF DENTAL SURGERY OF NEW JERSEY.

THE quarterly meeting of the American Academy of Dental Surgery of New Jersey will be held on Saturday, May 11, 1895, at 6 P.M., at No. 943 Broad street, Newark, N. J. James G. Palmer, D.D.S., of New York, will read a paper on the new antiseptic, "Borolyptol."

CHARLES A. MEEKER, *Secretary.*

## EAST TENNESSEE DENTAL ASSOCIATION.

THE twenty-eighth annual meeting of the East Tennessee Dental Association will be held at Harriman, Tenn., on Tuesday, June 11, 1895.

GEO. C. BRAUSE, *Secretary*,
Harriman, Tenn.

## SOUTH CAROLINA STATE DENTAL ASSOCIATION.

THE regular annual meeting of the South Carolina State Dental Association will be held at Spartanburg, S. C., July 2, 1895.

J. C. OELAND, Spartanburg, S. C., *President.*
C. BUNTING COLSON, Charleston, S. C., *Cor. Secretary.*

The State Board of Examiners meets at the same time and place.

## NEBRASKA STATE DENTAL SOCIETY.

THE twentieth annual meeting of the Nebraska State Dental Society will be held at Norfolk, May 16, 17, and 18, 1895. A good program is provided, and a large attendance is looked for.

O. M. HUESTIS, *Cor. Sec.*,
117 N. Eighth street, Nebraska City, Neb.

## NORTH DAKOTA DENTAL SOCIETY.

THE thirteenth annual meeting of the North Dakota Dental Society will be held in Fargo, May 15, 16, and 17, 1895. C. L. ROSE, *Secretary*,
Fargo, N. D.

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## SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS.

THE South Dakota State Board of Dental Examiners will hold its annual meeting at Sioux Falls, South Dakota, on June 4 and 5, 1895.

Any who may desire to begin the practice of dentistry in this state are requested to be present at this meeting for examination. Certificates issued only at regular annual meetings. W. H. H. BROWN, *Secretary*.

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# EDITORIAL.

## TAX-FREE ALCOHOL.

WE are not aware that attention has been definitely directed to the question of tax-free alcohol as a matter which concerns the interest of the dental profession of this country. There appear to be grounds for the belief that dentists are, under existing circumstances, paying a price for this indispensable material altogether beyond what they are legally required to pay, and we call attention to certain facts with a view to arousing an interest in the matter of securing to the dental profession the benefits of section 61 of the present customs law, which permits the purchase of alcohol free of government tax when used for purposes of the arts or manufactures.

The present tax rate is $1.10 per proof gallon, or $2.07 per wine gallon of 94 per cent. alcohol. The price paid to the dealer by the retail consumer is not less than $2.50 per gallon.

If the law relative to tax-free alcohol were operative the consumer could purchase an original package of say twenty gallons, which at $2.50 per gallon would cost $50, and when this had been consumed by presenting the tax stamp, and claiming the tax rebate under the law of $2.07 per gallon, would receive $2.07 × 20 = $41.40. Deducting this amount from that originally paid—viz, $50—would leave $8.60 as the net cost of alcohol used, or about forty-two cents per gallon. It will be seen that the dental profession pays the government about 400 per cent. on all alcohol used in spirit lamps, for heating, in vulcanizers, as a solvent, etc.

The agitation which culminated in the passage of section 61 of the customs law permitting the use, tax-free, of alcohol in the arts and manufactures, had been progressing for years previously. Though the legislative enactment has been secured, the treasury department has thus far not put it into effective operation on the plea of want of appropriation, and of ambiguities of the law rendering it almost impossible to frame adequate regulations.

While dentists individually may not be in a position generally to receive the benefits of the law, as probably few, if any, would purchase original packages, they as a body are large consumers.

We can only roughly estimate the amount of alcohol annually consumed by dentists; but we may assume that, for the purposes of his work, each dentist in the United States uses three gallons annually, on which he pays a tax of, roughly, $2.00 per gallon. On this basis the total amount of government tax paid by dentists on the alcohol they use each year in the United States would reach upwards of $125,000. If these figures give even an approximation of the exact amounts, they will show the importance of the matter to dentists, and should enlist their interest on the side of tax-free alcohol.

It must be remembered that the law when in effect will not permit any druggist to sell alcohol, even if it is to be used by others for manufacturing purposes, and claim the rebate, without violating the law.

According to section 61 of the customs law, alcohol is free only to the person using it for manufacturing purposes, and it is free to him only by his obtaining it in original packages, and by presenting the tax-paid stamps to the officer of Internal Revenue for rebate claim, subject to the regulations which may be prescribed. These will no doubt embrace a requirement of an explanation of the particular purpose for which the alcohol was used.

The question at issue has been brought to our attention by the chairman of the committee on legislation of the National Wholesale Druggists' Association, and believing that the interest of the dental profession is in no small degree involved in the outcome, we gladly lend the aid of the DENTAL COSMOS toward securing to our colleagues from the tax-free-alcohol law whatever of benefit they may be entitled to.

As an important aid in this direction we would request all dentists who are interested to send, on a postal card or otherwise, to the editor of the DENTAL COSMOS an estimate of the amount of alcohol annually consumed in their work, in order that the data may be used in preparing a report to the committee having the legislative phase of the matter in charge.

## THE "UNLAWFUL COMBINATION."

UNDER the title, "A Reply to the Editorial in the DENTAL COSMOS," the *Dental Digest* for April discusses at some length certain alleged causes for dissatisfaction with the editorial management of this journal in its relation to the interests of the Dental Protective Association and the Dental Protective Supply Company. With the conditions previous to July, 1891, which considerably antedates the creation of the Dental Protective Supply Company, the present editor of the DENTAL COSMOS had nothing to do, and since his incumbency this journal has not been approached in the interests of the Supply Company.

Questions pertaining to the business of manufacture and sale of dental materials and supplies are matters in which the editorial department of the DENTAL COSMOS is not interested or concerned. Conversely, the business of its publisher as a manufacturer of and dealer in dentists' supplies is in no degree a factor of the editorial management.

The editor of the DENTAL COSMOS is primarily intent on producing, so far as it may be in his power, a journal that will adequately meet the needs of the dental profession. He has no relationship with nor interest in the dental supply business, and therefore, because his knowledge of the point raised by the editor of the *Dental Digest* is inadequate, the following communication from an authority on the matter is here appended, for the benefit and information of those who care to know the facts of the case :

DR. EDWARD C. KIRK.

*Dear Doctor*,—In answer to your verbal inquiry, I would say that I have read the editorial in the March number of the *Dental Digest*, entitled "A Reply to the Editorial in the DENTAL COSMOS," in which it is stated that before you became editor of the DENTAL COSMOS, "nearly all the large dental supply houses entered into a trust," which farther on is characterized as "an unlawful combination."

The reference is, of course, only to the American Dental Trade Association.

In the COSMOS of August, 1889, and in a number of other dental journals about that time, there was published at the request of the American Dental Trade Association an article, entitled "An Explanation," which set forth in full the objects and methods of the Association. Previous to that time there had been great misunderstanding, and much ignorance, among dentists generally with regard to the objects of the Association, and many wrong statements were made. The article itself was drawn out by a series of resolutions passed at a meeting of dentists, in which the Association was attacked. The effect of the article was to silence at once the adverse criticisms that had been so freely indulged in, and very few such have been current during the last five years. It remained for this new dental supply house, whose interests are in the keeping of the *Dental Digest*, to attempt to raise the dead by publishing anew that which was shown to be false years ago.

I quote from "An Explanation," as follows :

"Neither at the formation of the Association, nor at any time since, has the price of a single article been advanced because of its operations. On the contrary, a comparison of the rates of to-day with those prevailing eight years ago will show many, and in some instances large, reductions. Further, these reductions have almost all been brought about by competition inside the Association. All the talk about 'combination,' 'dental trust,' 'pool,' etc., as affecting prices, is absolutely baseless. There is but one rule of the Association that bears at all upon prices. Manufacturers, who are in almost every instance retailers as well, fix the retail prices of their own goods, as they always did, but the members who handle those goods agree to abide by the manufacturers' prices, which formerly they did not always do. In other words, the manufacturers permit the dealers all over the country to make a profit on the sale of their productions, at their prices, on the simple agreement that they shall not be undersold on their own goods. But the manufacturer can change his prices whenever he chooses, without let or hindrance, the only stipulation being that he will notify those who are dealing in his goods, that they may conform to the changes. Furthermore, in the case of two or more manufacturers making the same grade of goods, each is free to make his own rates, without any reference to the others. Thus the White Company and Mr. Justi have at present the same list of prices for teeth, but each house can change its rates at will, without consultation with the other, or with any one in the Association.

"Competition is also unrestricted; there is in no sense any pooling of interests, any limitation of production. Each member of the Association pushes his business 'for all there is in it,' just as though no Association was ever thought of. It could not be held together for a week on any other basis. It has been held together all these years on this foundation by a better acquaintance with each other than formerly, by mutual respect and friendly intercourse, by honorable dealings with each other, and by absolute non-discrimination."

These words were, and are to-day, strictly true. The course of the trade since 1889 has only made them more emphatic. This formidable "trust" has not advanced a single price, and never did; it has not even kept prices firm. The very numerous changes in prices, almost always downward, were made by the individual manufacturers, without Association action, and without consultation with the other members. They have been brought about mainly by competition among the members of the Association, which is no more of a "trust," in the modern definition of that word, or "an unlawful combination," than is any dental society or any board of trade.

The S. S. White Dental Manufacturing Company has been a member of the Association from its organization, because it was believed to be very desirable that the various members of the trade should be in harmony. The annual meetings have produced sociability and kindly feelings, as well as wise regulations of trade matters. But this company would never consent to pool issues with any one else in the trade, to be dictated to in regard to its prices, to be limited at all in its business energy or field of operations, or submit to any of the restrictions that pertain to modern "trust" methods.

As the pioneer and leading dental supply house of the world it has a trust, but it is a high and honorable one, whose object is to advance the true interests of its great constituency, the dental profession, all over the world, by every means in its power.

The success of this company to this time has been secured on this line, and its future prosperity will doubtless be just in proportion to the progress of the profession which it serves.

If the American Dental Trade Association should ever adopt any measure that is calculated to injure the dental profession, or militate against its best interests, this company may be counted upon to withdraw from it at once.

The above will answer briefly your inquiry with regard to the Trade Association; but more might be said, of interest to those, if any there be, who still think that it is oppressive to the dental profession.

Sincerely yours,

H. M. Lewis,

*President The S. S. White Dental Mfg. Co.*

Philadelphia, April 19, 1895.

# OBITUARY.

## DR. D. BRUSH.

DIED, at No. 341 W. Twenty-second street, New York City, February 10, 1895, of ethmoiditis and cerebral abscess, DEMOSTHENES BRUSH, D.D.S., in the thirty-fourth year of his age.

Dr. Brush's death was sudden and unexpected, for, with the exception of some catarrhal trouble, his health had been excellent up to a recent period. He was born in New York City, March 24, 1861. He commenced the study of dentistry in 1875, with Dr. G. W. Carmen, of Englewood, N. J. He was a graduate of the Philadelphia Dental College, class of 1889, and in March of that year opened an office at No. 47 W. Sixteenth street, New York, where he continued for five years, when he removed to the New Metropolitan Building, No. 1 Madison avenue.

Dr. Brush was a member of the Garretsonian and other societies. In stature he was somewhat remarkable, being six feet four inches in height, and weighing two hundred and thirty pounds. In October, 1889, Dr. Brush was married to Emma Gertrude Riggins, who survives him.

## DR. C. M. GAYLORD.

DIED, at Mason City, Iowa, March 12, 1895, of paralytic apoplexy, Dr. CHAUNCEY M. GAYLORD, in the sixty-seventh year of his age.

Dr. Gaylord was born in Hamilton, N. Y., February 5, 1828. When a young man he studied medicine, of which he acquired an extended knowledge, and was considered a good surgeon. In 1853 he commenced the study of dentistry in Earlville, N. Y., and afterward continued his studies in New York city. In 1859 he entered practice in Otsego, N. Y., but went west to Wisconsin in 1865. In 1869 he removed to Mason City, Iowa, where he entered upon what proved to be a long and successful practice.

Dr. Gaylord was a man of fine natural ability, was well educated, and was very proficient in his chosen profession. He was a member of the Iowa State Dental Society. In 1866 he married, at Dodgeville, Wis., Miss Virginia O. Wheeler, who survives him with six children.

## DR. GEORGE L. MASON.

DIED, in New York city, March 12, 1895, of heart-failure, GEORGE LEONARD MASON, D.M.D., in the forty-third year of his age.

Dr. Mason was born at Saco, Maine, November 26, 1852. He studied dentistry with his father, Dr. Jeremiah Mason, who was long a prominent dentist of Saco, and who died in September, 1892.

In 1874 the subject of this sketch graduated from the Dental School of Harvard University. He immediately went to Brooklyn, N. Y., where he practiced for several years; then removed to New York city, and was in practice there up to the time of his decease.

Dr. Mason was a member of the Second District Dental Society ot the State of New York, of the New York Odontological Society, and of the American Academy of Dental Science, of Boston, Mass. He was married at Saco, Maine, March 30, 1880, to Miss Helen A. Jordan, who survives him, but without children.

## DR. GEORGE C. GAMMON.

DIED, at Pawtucket, R. I., February 25, 1895, of kidney-disease, Dr. GEORGE C. GAMMON, in the forty-first year of his age.

Dr. Gammon was born at Buckfield, Me., March 11, 1855. He studied dentistry with Dr. N. Gammon and Dr. Woodbury, and subsequently entered practice at Brockton, Mass. He had for many years, however, been in practice at Pawtucket, R. I., up to the time of his decease.

September 20, 1882, Dr. Gammon was married to Miss Cora F. Brattles, of Brockton, and she survives him with two children. He was a man of exceptional ability, and much respected by all who knew him.

## DR. SAMUEL HASSELL.

DIED, in New York city, March 15, 1895, of la grippe, Dr. SAMUEL HASSELL, in the seventy-fifth year of his age.

Dr. Hassell was born in Birmingham, England, August 8, 1820. Coming to America when a young man, he entered upon the study of dentistry about 1850 with Dr. John Hassell, of Newark, N. J., and in 1852 he commenced practice in New York city, where he has been long and familiarly known in the profession.

In 1865 Dr. Hassell was graduated from the University of Pennsylvania. He was long a member of the First District Dental Society of the State of New York. In 1859 Dr. Hassell was married to Miss Josephine V. Hutton, of Jersey City, N. J., who survives him. They had nine children

## DEATH OF DR. PATRICK.

WE stop the press to announce briefly the death of Dr. John J. R. Patrick, which occurred at his home in Belleville, Ill., on April 10, after a long illness. Dr. Patrick was a prominent figure in dentistry,—a valued worker in both its scientific and practical departments. His death will be deeply deplored for his personal qualities and professional attainments. An account of his life and labors will appear in a subsequent issue of the DENTAL COSMOS.

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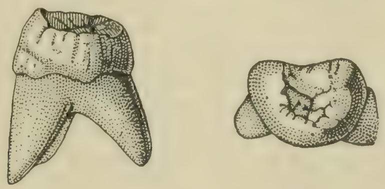
# PERISCOPE.

PITHECANTHROPUS ERECTUS.—In *Science* of March 1, 1895, Dr. Harrison Allen has the following communication:

MR. EDITOR: In *Science* of January 11, p. 47, Dr. D. G. Brinton reviews under the title "The Missing Link Found at Last," Dr. E. Dubois' memoir on *Pithecanthropus erectus*. Dr. Brinton, while accepting the dental apparatus to be of the simian type, acknowledges that the skull is like the famous Neanderthal man, and that the femora are singularly human. Professor O. C. Marsh (*Silliman's Journal*, February, 1895, p. 144) calls *Pithecanthropus* an "ape-man." In another place he alludes to it as a "large anthropoid ape." A communication signed "R. L.," presumably Richard Lydekker, appeared in *Nature*, January 24, 1895; the ground is taken that the femur of *Pithecanthropus* is "actually human;" that the skull "can belong to no wild anthropoid;" and that the molar may "perfectly well be human."

It thus appears that differences of opinion are already being entertained, respecting the validity of *Pithecanthropus*. I have ventured to make a contribution to the subject, since I quite agree with "R. L." The single tooth preserved (see the accompanying cut) is the third upper molar. It possesses two divergent root-stems. Contrary to what one expects, the smaller part of the crown forms the outside (buccal), and the larger the inside (palatal) surface. Dubois thus describes the tooth on the assumption that the broader of the two roots represented two other confluent roots. If the broader half of the crown were outside (as it appears to be from the figure) the identification of the tubercles on the grinding-surface would be easy. As it is, it is difficult, if not impossible, to name the cusps. The tooth must be classified as irregular and degenerate. I am in the habit of naming such teeth, crater-like, since all sides of the crown are uniformly higher than the center, and the sides of the single valley are much fissured. We often meet with such teeth in man, but so far as I know they have not been seen in apes.



The tuberculation in the gorilla for the third molar is complete; the fourth cusp (hypocone), while rudimentary, is distinct. In the chimpanzee, according to Owen, the third molar is tritubercular, but in a specimen in the Academy of Natural Sciences of Philadelphia, it shows distinctly the rudiment of a hypocone. In the orang the third molar is distinctly quintitubercular, the fifth cusp being developed in the commissure between the mesocone and the hypocone.

The tooth of *Pithecanthropus* is larger than any human tooth with which I am familiar. The following table will place its measurements in harmony with ape and human teeth:

| | Length. | Width. |
|---|---|---|
| Pithecanthropus | 11.3 mm. | 15.3 mm. |
| Gorilla | 14.1 " | 13.5 " |
| Orang | 12 " | 13 " |
| Chimpanzee | 10 " | 10 " |
| Native of Australia (1) | 10 " | 13 " |
| " " " (2) | 10 " | 14 " |
| " " Sandwich Islands | 10 " | 13.5 " |

In Owen's Odontography the gibbon is seen to possess a molar of length 6 mm. and width 7.5 mm.; but even here the form of the tooth is quite unlike that of *Pithecanthropus*, being tritubercular with a rudimental hypocone. The tooth, unlike that of any anthropoid ape examined, is much wider than long. The proportion of the width in comparison to the length is much the same as in the third molar of the human subject. The great size of the tooth and the possession of three roots, forming two diverging root-stems, are distinguishing characters, but they are not simian. Some allowance must be made for the great variability in the shape of the third upper human molar.

Respecting the calvarium, I note in the view of the vertex a median elevation apparently over the interfrontal suture. This is often met with in the human skull, but so far as I know is never seen in the skull of the ape. The recession back of the external orbital process differs only in degree from that seen in man. The femur is indubitably human. HARRISON ALLEN.

PHILADELPHIA, February 14, 1895.

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## HINTS, QUERIES, AND COMMENTS.

CLASPS FOR PARTIAL DENTURES.—To make a perfect-fitting clasp, obtain a true model of the mouth, and having decided which teeth you intend clasping, take a strip of tea lead or heavy tin foil of the required width, and fit it accurately to the plaster tooth, shaping the edge next to the gum in conformity with the irregularities in the latter around the neck of the tooth. Cut an exact counterpart of the pattern thus obtained from a piece of clasp metal, about 27 or 28 Brown & Sharpe gauge. This should be conformed as perfectly as possible to every portion of the surface of the tooth embraced by it; remove the clasp and cut a counterpart of pattern from a piece of pure gold plate, 36 gauge. Having previously studied the articulation, cut this metal, allowing a small end to extend onto grinding-surface, at a point where it will not interfere with the bite. This material being thin, can be fitted perfectly to the plaster tooth. Bending the end down onto the grinding-surface and placing the previously made clasp directly over it, fill up the intervening space with hard wax; when cold, remove the whole clasp carefully from tooth, invest, and flow solder between the two clasps. Fit the clasps to the other teeth in the same manner, and proceed as usual. If the clasp is intended for vulcanite plate, attach a strip of gold or platinum to it, in such a position that it will be inclosed in the rubber.

The advantages of this clasp are perfect coaptation, excluding all solid substances from between the clasp and tooth; preventing decomposition of food, and pressure of the plate on the gum-tissue.—F. MESSERSCHMITT, D.D.S.

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# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

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# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING MARCH, 1895.

*March* 5.—No. 535,195, to H. W. CREELMAN and J. E. BYRNE. Dental cabinet.
" " No. 535,225, to HENRY H. SCHUHMAN. Dental plate.
" *12.*—No. 535,421, to WM. M. SEEGER. Artificial tooth-crown.
" " No. 535,590, to HENRY F. LIBBY. Dental heater and annealer.
" " No. 535,672, to EDMOND H. CASGRAIN. Vulcanizer.
" " No. 535,783, to GEO. W. ARCHER. Head-rest.
" *19.*—No. 535,905, to WM. P. HORTON, JR., and A. B. JONES. Method of and apparatus for obtunding nerves.
" " No. 536,007, to C. W. BARNEY. Dental appliance.
" " No. 536,166, to E. H. ANGLE. Dental regulating pliers.
" *26.*—No. 536,227, to D. C. MCNAUGHTON. Dental cast.
" " No. 536,327, to THOMAS G. CRYMES. Dental filling-tool.

THE

DENTAL COSMOS.

VOL. XXXVII. PHILADELPHIA, JUNE, 1895. NO. 6.

# ORIGINAL COMMUNICATIONS.

## AN INVESTIGATION OF THE PHYSICAL CHARACTERS OF THE HUMAN TEETH IN RELATION TO THEIR DISEASES, AND TO PRACTICAL DENTAL OPERATIONS, TOGETHER WITH THE PHYSICAL CHARACTERS OF FILLING-MATERIALS.

BY G. V. BLACK, M.D., D.D.S., SC.D., JACKSONVILLE, ILL.

(Continued from page 421.)

### *Second Paper.*

### THE FORCE EXERTED IN THE CLOSURE OF THE JAWS.

In the DENTAL COSMOS for May I have given in some detail studies of the physical characters of the teeth with reference to their diseases. Before proceeding to the study of the physical characters of filling-materials, it is necessary to determine as nearly as practicable the stress to which they will be subjected in the human mouth. This requires of us the determination of the force with which the teeth may be brought in occlusion by voluntary effort, and also the stress usually employed in eating, or in the usual mastication of the different articles of food. These determinations seem necessary as a basis for decision as to the strength required of materials to prevent them from being crushed or dislodged by the stress of mastication when placed in the teeth as fillings. It seems curious that men should have filled teeth all these years without having entered into a closer study of this subject than that afforded by clinical observation. Yet this seems to have been the case, for I do not remember of any scientific studies of this subject having been presented to the profession before the meeting of the World's Columbian Dental Congress in Chicago in 1893. In May, 1893, I presented a paper to the Illinois State Dental Society on the anchorage of proximate fillings in the bicuspids and molars,* in which the stress exerted in the occlusion of the teeth was treated as an unknown quantity. Attention was somewhat strongly called to the fact that it was unknown, and to its important relation to the anchorage of fillings. Within the next two months two of the members of the Illinois State Dental Society devised and constructed instruments for measuring the stress exerted by the jaws, both of which were presented at the congress which met in Chicago. One of these was by the late Dr. Patrick, of Belleville, Ill., and is illustrated on page 153 of the published proceedings. The other was by Dr. George J. Dennis, of Chicago, who presented to the congress a paper on the subject.*

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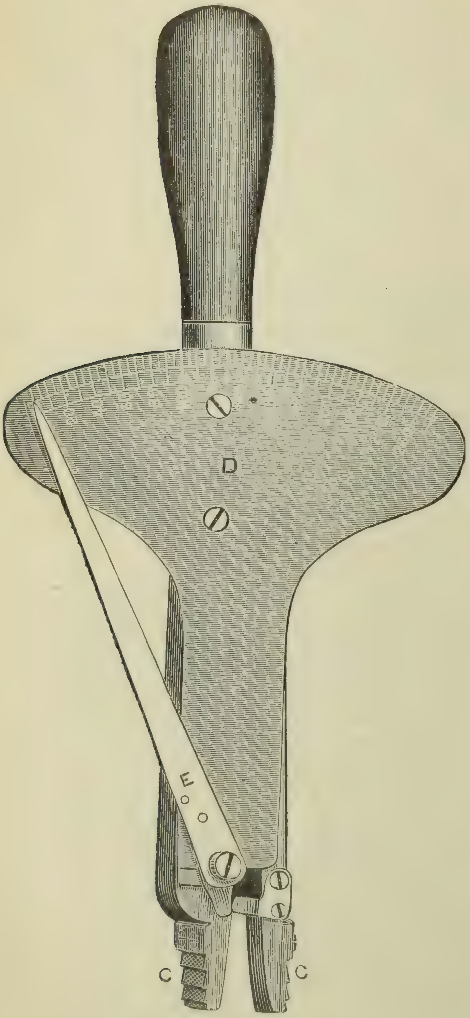
* Transactions of the Illinois State Dental Society, 1893. Also the *Dental Review* of June, 1893.

FIG. 5.



These instruments, being the first devised for this purpose, were not so perfect as could be desired, and seem to have given rise to some erroneous impressions. I have found the devising of an instrument for this purpose an exceedingly difficult matter, simple as it may seem at first glance, and one has not yet been produced that is altogether satisfactory. I present herewith illustrations of the instrument I have used in the determinations presented in this paper, the plan of which will be readily understood by a study of the engravings and accompanying description. The first serious difficulty encountered in the construction of instruments for this purpose is in getting the pads upon which the stress is exerted by the teeth close enough together so that the mouth of the person will not be opened so wide as to interfere with the power of the muscles, and at the same time have the apparatus sufficiently strong to be safe against breakage, and yet provide for sufficient movement to work an index needle for the efficient registry of the number of pounds' stress. One cannot exert the full force of the muscles with the mouth wide open, and the necessary thickness of material (steel covered with vulcanized rubber) between the teeth to prevent the liability to breakage is necessarily considerable. My instrument is almost three-fourths of an inch from surface to surface of the biting-pads when opened to the widest, and has a movement of one-fourth inch for the registry of two hundred and seventy pounds. Therefore it is only persons that exert a stress very nearly equal to the whole registry that are able to bring the teeth used within half an inch of an occlusion. I am of the opinion that the greatest stress of the muscles can be exerted only when the teeth come very near together, and for this reason the records do not represent the full force of the occlusion. Another difficulty is that in biting on the instrument with the bicuspids or molars the buccal cusps only are used, so that the stress is not evenly balanced on the peridental membranes. I must suppose that the teeth will bear the heaviest load when the whole occlusal surfaces are engaged.

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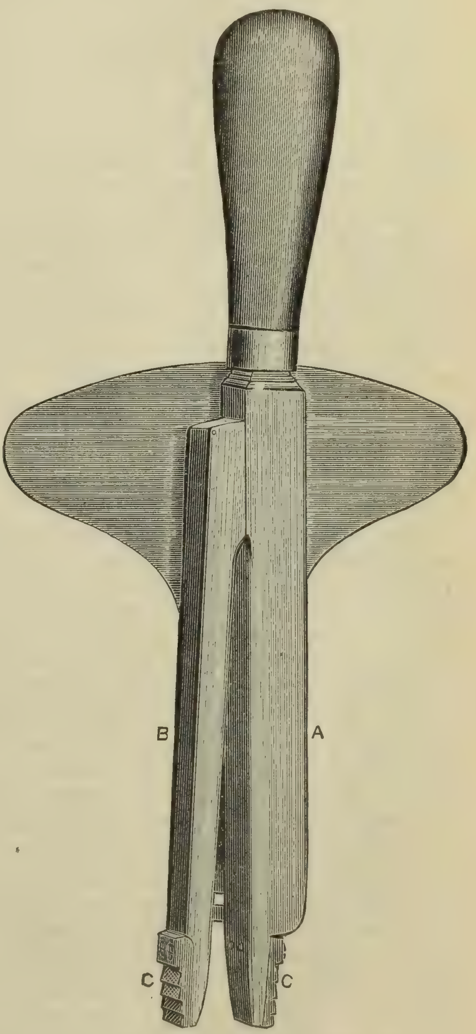
* "A Study of the Masticating Force of the Human Jaws." Dr. Geo. J. Dennis. Trans. W. C. D. Congress, page 786.

Fig. 6.



No matter how accurately these instruments are graduated, there is a considerable range of error in their use. This is partly for the reason that persons will bite near the extremity of the biting-pads, or distant from the extremity, making a difference of several pounds in the hundred. Again, it is not always practicable for persons to so fix the instrument between their teeth that the stress will be exerted in a perpendicular line, which is another cause of error. Altogether the range of error is not much less than ten per cent. Therefore it is only claimed that the figures given are approximately correct. They are more often too low than too high.

Another serious difficulty in taking records with the gnathodynamometer is in getting patients to exert the full stress of which they are capable. The instrument is not pleasant to bite upon, and many persons are fearful lest they break their teeth. Unless the matter is carefully approached, the probability is that the stress exerted will be one-half or two-thirds what the person is really capable of doing, or even, in many cases, much less than the person habitually uses upon food. This I learned after repeated efforts with individuals, many of whom have more than doubled the stress of the first trial at the second or third on different days. In one case a gentleman, whose record I was particularly anxious to get on account of the appearance of his teeth indicating the use of great force in mastication, could not be induced to exert a stress of more than twenty-five pounds on his molar teeth. Yet he will grind out the occlusal surfaces of crowns made of coin gold and reasonably filled with eighteen-carat solder in a remarkably short time, and fillings of pure gold when exposed to wear become terribly battered. I had the opportunity to see this patient at table crushing, with apparent ease, a piece of beefsteak which the phagodynamometer (presently to be described) showed to require a stress of sixty pounds on teeth much smaller than his. Of course I made no record of his effort, and I have generally not made a record when I was satisfied that the person had not made a reasonable effort.

Altogether, the difficulties of this measurement are very great, and we should not be surprised at some inaccuracies in the beginning. As to the paper alluded to before the W. C. D. Congress, the author has this to say:

"During the World's Columbian Dental Congress held in Chicago in 1893, a paper was read by the undersigned, and since published in the Transactions of that body (page 786), entitled 'The Masticating Force of the Human Jaws.' The statements in the paper were made in the belief that the instrument with which the results were obtained was accurate, and that the figures given were as nearly correct as possible under the varying conditions presented. A guarantee of the accuracy of the instrument was obtained from the maker before the figures were obtained.

"Later study of the instrument led to the belief that the full biting force of the jaws was not recorded because of the distance between the biting surfaces. The instrument was then remodeled with these surfaces closer, and with a registry of one hundred and fifty pounds, the earlier one having a limit of only ninety-five pounds. Dr. Black then took the instrument, and began investigating among the students of the Northwestern University Dental School. He obtained a number of records among these students, most of which were considerably higher than those mentioned in the paper. Then the discovery was made that this instrument was also faulty, and his record was, of course, worthless. Since then he reconstructed the instrument, and tested it carefully by means of a dynamometer made by Tiemann & Co., of New York, which was also carefully tested before it was sent him. This last instrument had a registry of one hundred and sixty pounds, but proved insufficient, as a number of persons were found who could exert a greater force. A fourth instrument was then constructed by Dr. Black, and carefully tested with a registry of two hundred and seventy pounds. This he supposed would cover the biting force of the human jaws, but was again disappointed, as one person has been found who could bring the arms together.

"The study of the masticating force of the jaws has been carried much further by Dr. Black than the writer has been able to do. His results are greatly at variance with those obtained by the writer in the paper above mentioned , but the variation is explained by the distance apart of the biting surfaces, and a possible variation of the spring used. A test of the third instrument by Fairbanks, Morse & Co., and by Dr. Black himself, showed as high a variation as twenty pounds at different periods. Dr. Black has experienced great difficulty in obtaining springs which would register alike at different times and under varying conditions. I desire to thank him for this opportunity to correct any erroneous impressions that may have been derived from the statements made in my paper of the congress, as I have no doubt as to the correctness, substantially, of the record which he presents.

"GEO. J. DENNIS, M.D., D.D.S."

The gnathodynamometer is disagreeable enough at best, and the difficulty with springs to which Dr. Dennis alludes has been caused by the desire to make the instrument as small and as light as possible. Therefore the springs have been too short, and an amount of bending required of them that was beyond their endurance. In the fourth instrument of which he speaks, after six had been made and condemned it was finally made much larger and longer, so that the steel would have a better chance of enduring the bending required. Occasional tests show this instrument to be maintaining its registry.

Through the kindness of Dr. Dennis, I made use of his instrument in Chicago and brought it home with me. A few days later Dr. C. B. Sawyer, of this city, forced the arms together with his molar teeth ; but immediately said that the instrument did not work smoothly. A critical examination for the cause discovered that there was an interference of some of the parts, and tests in my apparatus showed that occasionally over two hundred pounds was required to close it, the amount of interference being different in different positions. The register called for but one hundred and fifty pounds. When the interference of the parts was corrected, the scale was found to be too high. An additional spring was put in and a new register made. After a time it was noticed that the needle did not return to the proper point of beginning. Another test of the instrument showed that the spring had lost about fifteen pounds in the stress required to close it. Supposing that the spring would now remain permanent, a new scale was again cut, and after some further use of it, it was returned to Dr. Dennis. The doctor had it tested and found it wanting, and returning it to me I tested it, and also found it wanting. I took perhaps one hundred and fifty "bites" with the instrument altogether, but none of them are included in the records presented with this paper.

While it is probable that many of them are substantially correct, many of them probably are not, and the whole lot are consigned to the waste-basket.

The records which I present have been taken in Jacksonville by myself and Dr. Sawyer, mostly in our offices and among our patients. A few persons have been sought because it was thought that they would make a particularly high record, but in this we have been disappointed, as none of these persons have made as high a record as patients in our offices.

In order that the meaning of these records may be interpreted to the best advantage, the occupation (except married ladies, or those pursuing no vocation), sex, height, and weight of the persons are given.

GNATHODYNAMOMETER RECORDS.

| Number. | Occupation. | Sex. | Age. | Height. | Weight. | Incisors. | Bicuspids. | Molars. |
|---|---|---|---|---|---|---|---|---|
| 1 | Farmer | M | 25 | 5-5 | 127 | 55 | | 125 |
| 2 | Railroad Passenger Agent | M | | 6 | 203 | 100 | | 210 |
| 3 | Railroad Man | M | | 5-7 | 128 | | | 150 |
| 4 | Butcher | M | | 5-9 | 155 | 160 | | |
| 5 | Bookkeeper | F | | 5-3 | 112 | 40 | | 130 |
| 6 | | F | | 5-5 | 90 | 85 | | 125 |
| 7 | Miss, 7 years old | F | 7 | 3-4 | 56 | 30 | | 65 |
| 8 | Servant Girl | F | 23 | 5-2 | 98 | 45 | | 100 |
| 9 | Teacher | M | 45 | 5-2 | 140 | 100 | | 140 |
| 10 | Dentist | M | 38 | 5-6 | 165 | 175 | | 240 |
| 11 | | F | 30 | 5-2 | 130 | | | 155 |
| 12 | Grocer | M | 28 | 5-9 | 140 | 85 | | 160 |
| 13 | School Girl | F | 18 | 5-2 | 117 | 75 | 135 | 150 |
| 14 | Laborer | M | 40 | 5-9 | 190 | 100 | | 180 |
| 15 | Physician | M | 31 | 5-6 | 180 | 75 | | 130 |
| 16 | Salesman | M | 22 | 5-7 | 140 | 80 | | 135 |
| 17 | Music Teacher | F | 25 | 5-6 | 110 | 65 | | 120 |
| 18 | School Girl | F | 18 | 5-6 | 110 | 50 | | 75 |
| 19 | | F | 24 | 5-4 | 130 | 90 | | 160 |
| 20 | Temp. Molars | M | 8 | | | | | 65 |
| 21 | Merchant | M | 30 | 5-10 | 140 | 45 | | 155 |
| 22 | Music Teacher, on Bridge | F | 35 | 5-5 | 120 | | | 145 |
| 23 | On Temp. Molars | M | 8 | | | | | 45 |
| 24 | Farmer | M | 26 | 6-3 | 200 | 60 | | 145 |
| 25 | Watchman | M | 25 | 5-8 | 150 | 100 | | 160 |
| 26 | Artist | F | 35 | 5 | 110 | 45 | | 65 |
| 27 | School Girl | F | 19 | 5-11 | 123 | 60 | | 135 |
| 28 | | F | 24 | 5 | 110 | 45 | | 60 |
| 29 | Chinese Laundryman | M | | 5-4 | 140 | 50 | | 165 |
| 30 | Grocer | M | | 5-10 | 204 | 130 | | 170 |
| 31 | Athlete | M | | 6 | 230 | 70 | | 160 |
| 32 | Butcher | M | 30 | 5-5 | 176 | 140 | | 165 |
| 33 | Lawyer | M | | 5-9 | 164 | 65 | | 160 |
| 34 | Blacksmith | M | 45 | 5-8 | 195 | 45 | | 140 |
| 35 | Machinist | M | 40 | 5-3 | 130 | 80 | | 160 |
| 36 | Banker | M | 35 | 6 | 148 | 30 | | 70 |
| 37 | Bank Clerk | M | | 5-5 | 130 | 60 | | 85 |
| 38 | Dentist | M | 35 | 5-8 | 220 | 45 | | 160 |
| 39 | Grocer | M | | 5-8 | 150 | 80 | | 160 |
| 40 | Farmer | M | | 6 | 170 | 90 | | 190 |
| 41 | Temp. Molars | M | 4½ | | 40 | | | 45 |
| 42 | School Girl | F | | | 100 | 70 | | 120 |
| 43 | Physician | M | 35 | 5-11 | 205 | | | 270 |
| 44 | Printer | M | 32 | 5-6 | 105 | | | 70 |
| 45 | School Girl | F | 19 | 5-5 | 120 | | | 100 |
| 46 | Student | M | 18 | 5-8 | 130 | 70 | 130 | |
| 47 | School Girl | F | | 5-4 | 102 | 50 | | 120 |
| 48 | Physician | M | 32 | 5-7 | 135 | | 185 | |
| 49 | Dentist | M | 40 | 5-5 | 120 | 60 | | 100 |
| 50 | Athlete | M | | 5-7 | 150 | 120 | | 165 |

In studying the records of the gnathodynamometer the reader will doubtless be struck with the wide variation in the results. It is plainly apparent that the physical strength of the person is not the important factor. It is true, however, that those making extraordinary records have been strong men, except in case No. 10, Dr. C. B. Sawyer, with a record of two hundred and forty pounds, who is well known to the profession of Illinois. No one would expect from his appearance that he would exhibit very unusual strength. No. 43 is a physician, about thirty-five years old, and a large, well-formed man, with unusually large molar teeth. He simply shut the instrument up (the instrument registers two hundred and seventy pounds only) at the first effort, bringing the prongs together with a chugg, and seemed to do it with perfect ease. I was watching him carefully, and saw that the biting-pads rested on the buccal cusps of the first upper and first lower molars only. I had placed medium large gold fillings in the occlusal surfaces of these teeth fifteen years before, and they have stood perfectly. His incisors were out of condition at the time, and sore, so that I was not able to take a record of what he could do with them. No. 2 is also a large and strong man, and made a record of two hundred and ten pounds. But he is certainly not a stronger man than No. 24, who made a record of only one hundred and forty-five pounds. With the exception of a few persons, the apparent physical strength seems not to be the controlling factor. Generally persons biting on the gnathodynamometer, and endeavoring to exert their full power, stop because it *hurts their teeth*, and not because they have exerted the full strength of their muscles. The *condition of the peridental membranes* seems to be the controlling factor rather than muscular strength. The instrument, then, tests the condition of these membranes, and, in the absence of disease, the ability of the peridental membranes to bear heavy stress is probably dependent upon the habits of the person, or upon the use to which they are habitually subjected in the mastication of food. A person who habitually crushes down anything offered as food, hard or soft, thinking nothing of it, will accustom the membranes of his teeth to heavy stress. The person who does his or her chewing with the least possible effort will not accustom the membranes of the teeth to a greater stress than the medium of foods require, and will often find beefsteak tough. Such persons cannot make a high record on the gnathodynamometer. This instrument then becomes a means of detecting the habits of our patients at table, and I have found it explaining results in filling teeth that before had been a mystery to me, matters that I will try to make plain when discussing filling-materials. That the pain felt when biting on the gnathodynamometer is in the membranes, and not in the teeth themselves, seems very clear after a careful study of it. Among others on this point I have this observation. No. 13 of the records, a school-girl, eighteen years old, had a lower bicuspid that was badly decayed both mesially and distally, the lingual cusp being almost destroyed, though the buccal cusp was fairly strong. In excavating the tooth the dentine was found exquisitely sensitive. As a test of the condition of the peridental membrane I placed the gnathodynamometer so that it would rest on the buccal cusp of that tooth only in the lower jaw, and asked her to bite down on it till it hurt. She promptly sent the index needle to one hundred and thirty-five pounds. She then took the instrument between the molars of the other side, and made a record of one hundred and fifty pounds. On questioning her as to the difference in the sensations produced in the two positions, she said they were the same. This has been the general answer. It seems that teeth in which the dentine alone is sensitive bear stress as well as perfectly healthy teeth, but a little affection of the peridental membrane destroys, for the time, the use of the tooth.

How useful this instrument may become to us in the detection of the condition of peridental membranes and in learning the habits of patients in the use of the teeth cannot be determined in the short use I have now made of it, but that it may be very useful on occasion is already demonstrated. It has become a practical instrument at my chair.

In the paper on the anchorage of proximate fillings in bicuspids and molars before the Illinois State Dental Society, alluded to on a previous page, I stated that each tooth must be able to bear the whole force exerted by the muscles of mastication. While theoretically this must be true, practical tests show that the muscular effort is so closely graduated to the stress that the peridental membranes are able to endure, that the statement is practically incorrect. I think it may safely be said that the great majority of our people never exert the full power of the muscles closing the mouth. The habits of civilized people in the preparation of food render the use of great force in mastication unnecessary, and much the greater number fall into the habit of using but little more than the necessary force. Many persons guard a sore tooth so carefully as to hurt it but rarely, though they chew their food fairly well. Many porcelain crowns that are much too frail to bear the stress usually used by the persons wearing them continue to stand, because the condition of the peridental membranes of the roots is such that the person almost unconsciously avoids their use, except on the softest of foods. Also, many fillings stand only because they are not subjected to heavy stress.

### The Stress Exerted upon Artificial Teeth.

While I have made no particular effort to obtain many tests of the stress that could be exerted by artificial teeth, I have tried a number of persons. On full plates, upper and lower, the stress exerted has been from twenty to thirty pounds. On upper plates, with natural teeth below, forty pounds has been exerted in a few cases; and Dr. G. B. Cary, of Perry, Ill., a dentist, made the remarkable record of eighty pounds upon artificial teeth above and natural teeth below. It must be said that the exertion of the full stress possible to artificial teeth is not practicable with the mouth opened as wide as is necessary in biting on the gnathodynamometer, but with all allowance for this, these trials show them to be sadly deficient in masticating power as compared with the natural organs. Perhaps it is well that so many persons fail to realize what they have lost, and, as the recovery of it is not within the range of possibility, perhaps the less said about it the better. But a study of the records of the gnathodynamometer and the records of the phagodynamometer, presented below, show only too plainly what it is.

### The Strength of the Teeth.

In a previous paper I have presented studies of the strength of the dentine and of the enamel, but have reserved studies of the strength of the tooth as a whole to be presented after the studies of the force of the occlusion. I have made an effort to determine what danger there may be of breaking teeth by the force of the occlusion, by careful tests of the strength of freshly-extracted teeth. In these tests the roots of the teeth were sawed squarely off near the gingival line and the crown was placed in the dynamometer, with the squared root-end resting on a flat steel plate for support. The stress was applied vertically on the cutting-edge of incisors, or on the points of the cusps of bicuspids and molars, using steel in contact with the teeth, or interposing various substances between the steel and the teeth tested.

Hard steel directly applied.

No. 1. Mesio-buccal cusp of second upper molar; a fairly sharp cusp. A portion of the enamel of the buccal portion of the cusp split away at one hundred and twenty-five pounds.

No. 2. A rather obtuse lingual cusp of the same tooth. The enamel checked over a small area, but the tooth not otherwise broken with a stress of three hundred and fifty pounds.

No. 3. Disto-buccal cusp of a second upper molar, rather sharp. The enamel began to check at one hundred and thirty-five pounds, and a part of the cusp split off at one hundred and sixty-five pounds.

No. 4. A well-rounded lingual cusp of a first upper bicuspid. A check in the enamel began to show at one hundred pounds, but no further break occurred with three hundred and fifty pounds. On removing the tooth, the enamel was found disintegrated over a small area where the steel was applied.

No. 5. A sharp buccal cusp of an upper first bicuspid. A check in the enamel began to show at one hundred and twenty-five pounds, and the buccal portion of the enamel split off at one hundred and fifty pounds. There was a deep mesial decay in this tooth.

No. 6. The disto-lingual cusp of a lower first molar. The mesial portion of the tooth had been destroyed by caries. A check in the enamel began at one hundred and fifteen pounds, and the cusp crushed at one hundred and fifty pounds.

No. 7. A sharp disto-buccal cusp of a lower second molar. A check began at one hundred pounds, and a part of the enamel split off at one hundred and forty pounds.

No. 8. A lingual cusp of an upper third molar. A check was seen at one hundred pounds, and a part of the enamel chipped away at one hundred and forty pounds.

In the following cases a slip of vulcanized rubber three thirty-seconds of an inch thick was placed between the steel and the cusp of the tooth.

No. 9. A fairly sharp buccal cusp of an upper first bicuspid. No injury at three hundred and fifty pounds, but the rubber was cut nearly through.

No. 10. A sharp mesio-buccal cusp of a second upper molar. No check appeared up to three hundred and twenty-five pounds. At three hundred and thirty-five pounds the rubber suddenly parted, letting the steel come onto the tooth, and the cusp was split off.

No. 11. The cusp of a cuspid. No injury at three hundred and fifty pounds.

No. 12. Edge of a central incisor. No injury up to two hundred and forty pounds, at which point the rubber suddenly cut through, allowing the steel to be thrust against the tooth, which was crushed.

As there was nothing especially different developed in the experiments made, these few cases give as good a view of the strength of the teeth as if I gave a hundred. It shows plainly that the teeth may be injured by biting upon the hard metals, pebbles, or other hard substances with the full force of the muscles, or even with much less than the full force in many cases. But upon any substance that will be even slightly indented by the cusps of the teeth, as hard rubber, and in this way increase somewhat the area of the enamel upon which the stress is supported, no exertion of the muscles can injure a tooth. Steel, iron, pebbles, or other absolutely unyielding substance bit upon are dangerous to the teeth, because they impinge upon too small an area of the enamel to support the pressure. Lead, or any of the softer metals, may be bitten upon without danger. Lead shot were tried between the cusps of bicuspids and molars in the effort to split them, but no injury was done until the lead crushed so as to let the steel come in contact with the enamel of the teeth. It appears, then, from these experiments, that breakage of the teeth, when sound, will not occur from any ordinary efforts in mastication of food except through the accident of catching some such substance as the harder metals or pebbles that have been introduced with the food by accident. This conclusion agrees substantially with clinical observation. Patients who come to us with fractured teeth, not carious, give a history of some accident, as a blow, a fall, or something of the kind in which the injured tooth was struck violently with some hard substance, or more rarely a history of catching some hard substance between the teeth in chewing food.

When hard steel was used in the experiments, the fracture produced was quite characteristic. In buccal cusps, for instance, the first appearance of a break would be a check in the enamel running from the point of contact with the steel. With the increase of the stress the enamel would split off, usually beginning with the outer half of its thickness and extending from one-fourth to one-half the length of the crown. This was confined to the buccal surfaces in buccal cusps, and to the lingual surface in case of lingual cusps. With an increase of the stress the remainder of the thickness of the enamel would come away. In a few instances the whole thickness of the enamel would come away at first, and in two or three the split included a portion of the dentine.

### Of the Stress Necessary in the Mastication of Food.

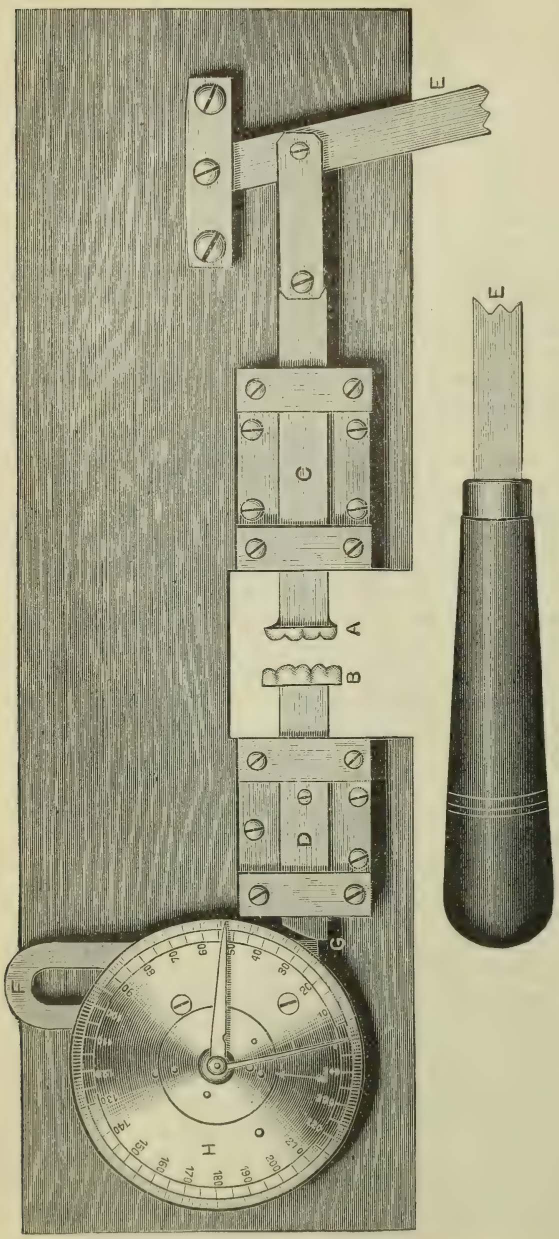
In the study of the stress persons are capable of exerting on the gnathodynamometer, we gain but little information of the stress usually, or necessarily, employed at table in the mastication of the different articles of food. It is probable that most persons often employ as much force in biting hard substances as they are capable of exerting by voluntary effort, or as much as their peridental membranes will conveniently bear. But in doing this they are generally conscious of making some extra effort. Persons at table use about a given amount of force in the closure of their teeth upon food without any particular consciousness of effort. This force is, with most persons, ample for the crushing of the ordinary foods to which they are accustomed. It is only when something out of the usual order is presented—something particularly hard—that they are conscious of effort. There are exceptions to this rule, however. Not a few persons frequently find things that are hard to chew, and examination with the gnathodynamometer detects the fact they are incapable of crushing hard substances, although they may not be otherwise wanting in physical strength.

It seems to have been supposed that most persons had a large reserve of masticating force over that ordinarily used; and that the force necessary was very little, only a few pounds. The only way to arrive at any satisfactory conclusion as to the stress ordinarily employed was to contrive means of weighing the stress necessary to crush the ordinary foods between teeth of average size and form. For this purpose I have devised and built the instrument illustrated in Fig. 7, the *phagodynamometer*. The manner of working the instrument will be easily understood by a study of the illustration and its accompanying description. It is very simple and effective, and after one has seen its workings on a particular article of food there is generally no doubt as to the stress required in crushing that particular specimen between the teeth. The teeth used in the instrument in the experiments detailed were two lower molars of normal form, medium size, and with cusps of medium length. These were brought in occlusion with a sufficient number of the teeth of the upper jaw to cover them ; and the effort was to have the occlusion about as perfect as the average found in persons twenty or twenty-five years old. In the records given this number of teeth, or the surfaces which they present, has arbitrarily been made the basis for the examination of the different articles of food. In the experiments, other forms of teeth, flat pieces of steel, etc., have been used. It is found that it requires more stress to crush food between flat surfaces than between tuberculated surfaces. It appears also that when the teeth have become so worn as to make what is called a perfect occlusion, the occlusal surfaces touching at all points, the stress required in mastication is greater than when the occlusion is less perfect. Long sharp cusps, with just a fair degree of closeness of the general surfaces and with a number of points of contact, seem to do the work well with the least stress. Teeth that are large call for more pounds' stress than small teeth. Food taken in large masses and covering a greater surface of teeth,—more teeth,—require greater stress ; while if the food is cut fine, or is taken in very small masses so as not to cover so large an area of tooth-surface, it may be crushed with less stress.

After experiment in this direction which seemed sufficient, and which cannot be given in detail for want of space, teeth of medium size, etc., as related above, were adopted as giving the best illustration of the stress required in eating the different articles of food. In studying these records they must be taken as representing a medium stress when delivered on two molars only, their occlusal surfaces being fully engaged.

After I had had some experience in the use of this instrument in the artificial mastication of food, and observation of the stress required, I found there might be some difference of opinion as to the exact manner of chewing food with the natural teeth, and therefore some difference in the stress shown by the instrument and the stress actually employed in eating. Therefore, in order to gain a clearer view of the opinion others might form by the study of the effects of the instrument, together with a closer consideration of the movements of their own masticatory apparatus, I went to Chicago and asked several persons of known ability as observers to witness the operation of the instrument. These were Dr. Geo. H. Cushing, Dr. C. N. Johnson, Dr. T. L. Gilmer, Dr. Geo. J. Dennis, and Dr. E. D. Swain. We secured a room at a restaurant and ordered such food as we desired for eating and for test, and spent about three hours in examining the process of mastication, both the natural and the artificial, and the stress employed. During the dinner, samples of various articles of food were subjected to mastication in the instrument, and the stress at which crushing occurred carefully noted by all, and the

Fig. 7.



THE PHAGODYNAMOMETER.

An instrument for determining the stress necessary in eating; or in the mastication of different articles of food. (Size reduced a little more than one-half.)

The instrument consists essentially of two lower molar teeth carved in brass (*A*), which are brought in occlusion with corresponding upper teeth (*B*). Both are fixed on the proximating ends of sliding bars (*C*, *D*), so arranged that the teeth may be brought in occlusion with considerable force by a lever (*E*). When the teeth are brought forcibly in occlusion, the sliding bar *D* is forced against the spring *F*, at its extremity *G*, and the stress exerted on the spring is registered upon the plate *H*. The register is provided with two needles, the broader one of which remains at the point of the highest stress exerted.

In use the instrument is clamped firmly to a heavy table, and any article of food to be tested is placed between the teeth and stress applied by means of the lever, and the number of pounds required to crush the food noted. The arrangement is such that the teeth may be removed and others substituted, or points of other form may be used.

motions of the teeth in the instrument were carefully compared with the movements of the natural teeth in the crushing of the different kinds of food, to see whether or not the movements of the instrument represented the normal movements in natural mastication. This kind of practical study of the subject soon brought the gentlemen present to one opinion.

In the crushing of meats between the teeth in the ordinary process of mastication, a light crackling sound is heard by the person himself, or by another, when his attention is called to it, which occurs at the moment when the fibers of the meat are being forcibly broken up, but in the tender steaks it is a feeble sound heard only by the person chewing. In the mastication by the phagodynamometer this sound is heard by giving attention to it, the same as in the mouth, and at the same moment the meat is seen to be forced from the grasp of the teeth to the buccal and lingual sides in a pulpy condition. The connection of these facts fixes definitely the actual crushing point of any of the meats, and of many other articles of food.

But in the habitual chewing of foods it had seemed to me that much more stress was employed than was actually necessary to the act of crushing it, and this point was subjected to careful study. The result was that all of the gentlemen present found themselves invariably exerting a considerable force after their teeth had crushed the food. This extra force becomes very appreciable to the person chewing when a bit of bone, or other hard substance, happens to be caught between the teeth. The amount of this extra stress could only be estimated, as we have no means of measuring it. Careful efforts were made to estimate this by the muscular sense, the crushing stress of the article of food having been ascertained. This was done by noting the stress by means of the muscular sense, and comparing by biting on the gnathodynamometer. This is, of course, an exceedingly crude manner of measurement, and was only an assistance in forming an estimate. The general opinion formed was, that in chewing a piece of beefsteak the crushing point of which was found to be from forty to forty-five pounds, from sixty to eighty pounds' stress was actually employed at each thrust of the teeth upon it ; and in order to arrive at the stress actually employed in chewing food, some such addition would have to be made to the figures representing the crushing point as shown by the phagodynamometer. The principal articles of food tested were beefsteak, which all regarded as very tender, and which was found to crush at forty to forty-five pounds ; mutton chops, thirty-five to forty pounds ; broiled ham, forty-five to sixty pounds, and a number of other foods having a very similar range.

In the study of the motions employed, it was found that in the mastication of meats persons with fairly good teeth used the direct up and down motion exclusively ; and that the phagodynamometer as constructed and used represented it satisfactorily. Indeed, this is the plan of mastication of all of the animals that subsist upon flesh, their jaws being so arranged that they have no lateral motion. It seems that man, when he uses flesh, or other foods that are directly crushable, uses habitually the same plan, and we are led to suppose that it is because it does the work with the least effort. In talking with various persons who had made some special study of these processes, and also in my correspondence, I found a general impression that the lateral or grinding motion was habitually employed in the mastication of such substances. This is evidently an error. While some persons may use lateral motions on meats, it is certainly exceptional. In the mastication of the cereal foods,—those made from grain of almost all kinds,—the lateral or grinding motions are largely employed. This is true also of the brittle foods of whatever nature. Indeed, many of these are so difficult to crush by direct pressure that it becomes impracticable; many kinds of food will be simply packed together between the teeth, and a stress of two or three hundred pounds will be insufficient to crush it out as meats are crushed. Many of the crusts from ordinary baker's bread when subjected to stress between the molar teeth will not be cut through with a stress of two hundred and fifty pounds; and they are not very hard crusts either. They are readily broken up, however, with a much lighter stress combined with a little lateral movement, especially as they become moistened with the secretions. It seems probable, however, that many persons unconsciously exert an enormous force upon such foods as are inclined to pack between the teeth. I am no longer surprised at the frequent breaking of frail teeth on bread crusts *that are not very hard.* It is but little wonder that porcelain facings on crowns and bridges are so often broken; and it seems to be a fact that many of the porcelain crowns upon roots stand only because there is sufficient irritation to cause the peridental membranes to be so tender as to induce the patients to avoid using them except on the softer foods. This habit of avoiding the use of certain teeth is, I find, usually formed unconsciously by the large majority of persons, especially in cases in which the teeth are tender to any considerable pressure, but not notably sore.

This subject is too new as yet for me to feel that I fully realize its import. Naturally, my mind has been much occupied with the continual list of surprises it has developed, and with the effort that has been required in the instrumentation to prevent deception by faulty instruments or faulty manipulation. I begin to see also that the conditions of teeth as regards the progress of caries should have been noted with much care in taking gnathodynamometer records; for that there is a connection between the enfeeblement of the masticatory effort and the continued progress of caries seems to be very certain. Enfeeblement of mastication and the lack of the vigorous scouring which it gives the teeth gives the opportunity for caries. On the other hand, there is a marked connection between vigorous chewing of food and certain classes of failure of fillings. Vigor in the chewing of food is largely a matter of individual habit, which if left to itself is likely to be permanent, but is liable to be changed by a change of conditions at any time. The control of this, as it now seems to me, will, in the future, become important in dentistry.

In the phagodynamometer records I present but a few of the most important articles of food. It has seemed to me that these give as good a view of the stress necessarily employed as if a complete list were given. The starchy foods are not given, for the reason that they are masticated so largely by the grinding motions which my instruments will not sufficiently imitate. But illustration of the stress necessarily employed is, perhaps, sufficiently accomplished.

## Phagodynamometer Records.

### *Crushing Point of Meats.*

| | |
|---|---|
| 1. Boiled corned beef, nice and tender | 30 to 35 pounds. |
| 2. Beefsteak, medium well done,—chuck | 40 " 60 " |
| 3. Beefsteak, well done,—chuck | 45 " 60 " |
| 4. Beefsteak, rare done, very tender,—loin | 35 " 40 " |
| 5. Beefsteak,—round | 40 " 50 " |
| 6. Beefsteak, well done and rather tough | 60 " 80 " |
| 7. Mutton chops | 30 " 40 " |
| 8. Mutton steak | 35 " 45 " |
| 9. Roast veal, tender and nice | 35 " 40 " |
| 10. Roast loin of veal | 30 " 35 " |
| 11. Roast beef | 45 " 60 " |
| 12. Roast beef,—loin | 35 " 50 " |
| 13. Pork chops,—loin | 20 " 25 " |
| 14. Roast pork | 30 " 35 " |
| 15. Broiled ham, tender and nice | 40 " 60 " |
| 16. Cold boiled tongue,—central part | 3 " 5 " |
| Near root of tongue | 15 " 20 " |

The following were selected by an experienced butcher as the toughest of meats,—only pure muscular tissue was used.

| | |
|---|---|
| 17. Cut from shank of an old animal, | |
| Fried, rare done | 60 to 80 pounds. |
| Fried, well done | 70 " 90 " |
| 18. Cut from the neck | 70 " 90 " |

and rarely the needle reached one hundred pounds before the crush occurred.

Note.—Several of those witnessing the experiments found no difficulty in the mastication of this meat, though they recognized it as being decidedly tough. It appears that those who are able to make a gnathodynamometer record of one hundred and twenty-five to one hundred and forty pounds masticate such meats without difficulty.

| | |
|---|---|
| Cut cabbage (cole-slaw) crushed at | 40 to 50 pounds. |
| Lettuce | 25 " 30 " |

Young radishes (six specimens), about three-fourths inches in diameter, broke at twenty to twenty-five pounds, and were well crushed at thirty-five to forty pounds.

### *Candies.*

| | |
|---|---|
| Crystals of rock candy, crushed at | 30 to 45 pounds. |
| Lemon tablets | 60 " 70 " |
| Hard candy marbles, three-fourths inch in diameter | 70 " 100 " |
| Ordinary hard stick candy, old | 90 " 110 " |
| Ordinary hard stick candy, fresh | 45 " 70 " |

Crushed portions of the last sticking between the cusps of the teeth were not crushed out with two hundred and fifty pounds

| | |
|---|---|
| Candy almonds, kernel of the nut inside | 35 to 45 pounds. |
| Lemon drops | 60 " 75 " |
| Oblong candy marbles, one inch by three-fourths | 100 " 150 " |
| Small cinnamon drops | 30 " 50 " |

Gum drops began to mash at about twenty pounds, but were not bitten through with less than two hundred and forty pounds.

Small stick licorice was crushed only enough to show plainly the indentations of the teeth at two hundred and fifty pounds.

### *Nuts.*

I. Filberts, large and fine, cracked at 60, 70, 95, 60, 75, 70, 75, 55, 65, 65, 75, 110 pounds. Average seventy-three pounds.

The kernels of filberts were broken up or crumbled at twenty to forty pounds, but to reduce them to pulp, or properly crush them, required fifty to sixty pounds.

II. Pecans, large fine nuts, cracked at 100, 115, 145, 115, 95, and 120 pounds. The kernels were generally broken up or crumbled at about twenty pounds, and reduced to a pulpy mass with the oil expressed at forty pounds.

III. Brazil nuts cracked at 140, 115, 110 pounds. The kernels broke or crumbled at fifteen to thirty pounds. They were difficult, however, to reduce to a pulp, requiring from fifty to seventy-five pounds.

IV. Almonds cracked at fifteen to fifty pounds ; kernels broke into crumbs at thirty to forty pounds ; reduced to a pulp with the oil expressed at fifty to sixty pounds.

V. Hazel nuts, old and dry, cracked at 170, 132, 115, 125, 165, 173, 140, 160 pounds. Of one hundred not one cracked at less than one hundred pounds, and three required over two hundred pounds. These were to all appearance just such nuts as boys usually crack with their teeth.

NOTE.—In the mastication of any of these nuts the crumbs may be broken finer and finer by repeated efforts with the lower pressure, but they do not assume the peculiar oily pasty consistence obtained by the higher pressure. This higher pressure seems necessary to obtain the finer flavor of the nuts, and they are also rendered much more digestible.

(To be continued.)

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# CATAPHORESIS AND SOLUTIONS OF $H_2O_2$ FOR BLEACHING TEETH, ETC.

BY WILLIAM J. MORTON, M.D., NEW YORK, N. Y.,

PROFESSOR OF DISEASES OF THE MIND AND NERVOUS SYSTEM AND ELECTRO-THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL.

By cataphoresis is meant the movement of fluids, together with the substances they may hold in solution, from the positive pole of electrodes conveying a continuous current in tissue, toward the negative pole. As signified by the derivation of the word " cataphoresis," the substance held in solution "goes down" with the current, that is to say, moves with its ordinarily accepted direction of flow, just as in electro-plating the metal held in solution goes down, *i.e.*, from a higher to a lower potential, and is deposited on the negative electrode or cathode. This comparison to what takes place in electro-plating might lead us to believe that cataphoric action was due to electrolysis, and it must be admitted that electrolytic and cataphoric action are not yet differentiated with sufficient clearness. But there is little reason to doubt that one action is as distinctive a property of the continuous current as the other. And, without entering into the reasons for this statement, it is enough to affirm, for all practical purposes, that fluids in tissue do move from the positive to the negative electrode. But there are exceptions even to this statement, for eosin travels from negative to positive, as also does an alcoholic solution of bromide of barium.

So much, in a brief way, for cataphoresis,—the general principle. Should we desire to make use of this principle to introduce medicines into human tissue, we may refer to the procedure as cataphoric medication. And to avoid confusion and theory, and the contradiction that some substances in solution travel upward rather than downward, I have proposed the terms electric diffusion and electric medicamental diffusion. These terms at least express the facts.

To secure successful electric medicamental diffusion, several important points may here be noted.

*a.* The medicine in solution must be brought into intimate contact with the tissue in order to constitute with it a comparatively continuous electrolyte.

*b.* Metallic conduction (of the electrode, the positive pole) must end very close to where electrolytic conduction begins ; that is to say, the absorbent material holding the solution must be thin and allow the metal electrode to come as near as possible to the tissue.

*c.* The negative electrode must be removed to a distant point.

*d.* If the tissue to be treated is the skin, it must be well washed with soap and water or ether or alcohol to remove the natural oils.

*e.* The solution used must be of neither too high a resistance nor of too low. If too high, like alcohol, ether, or chloroform, no current will be conducted ; if too low, like a saturated solution of common salt, cataphoric effects will not be pronounced.

With a view of ascertaining if discolored teeth could be actually and practically bleached by cataphoric medication, I performed the following experiments, assisted by Mr. Wm. J. Evans, of McKesson & Robbins, who kindly supplied the teeth, the pyrozone, and other chemicals required. But first, a word as to the necessary outfit. This should constitute (*a*) a galvanic battery of at least forty Leclanché cells or of thirty red-acid or Poggendorf cells, as sold in the ordinary portable battery, for a voltage of at least sixty volts is required ; (*b*) a rheostat ; (*c*) a milliamperemeter, and (*d*) a needle-holder for platinum wire.

The experiments were as follows, omitting numerous ones made for control, or those affording no definite results :

The first point was to establish if solutions of $H_2O_2$ would conduct electricity.

*Experiment 1.*—$H_2O_2$ twenty-five per cent., plus sulfuric ether seventy-five per cent. A few drops laid upon a glass plate, platinum wire electrodes placed one-half inch apart, forty cells equaling about sixty volts, gave only about one milliampere of current, a current strength too small for practical work.

Similar solutions of the same strength of $H_2O_2$ in chloroform, glycerol, and distilled water gave in the first two instances no current, and in the latter about two milliamperes.

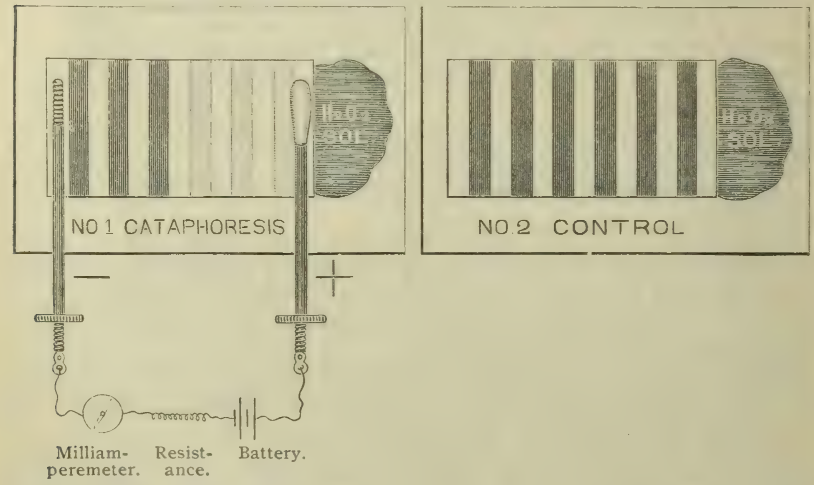
*Experiment 6.*—$H_2O_2$ twenty-five per cent., plus sulfuric ether seventy-five per cent., plus dilute sulfuric acid a mere trace, gave twenty milliamperes,—namely, sufficient for practical work if so desired.

*Experiment 8.*—$H_2O_2$ twenty-five per cent., plus sulfuric ether seventy-five per cent., plus solution of chlorid of sodium, afforded electric conduction, but the solutions did not mix, and therefore were impracticable to work with in that form.

*Experiment 11.*—A molar tooth containing a large cavity, leaving half of its crown still intact. The enamel of the crown was badly discolored by organic decomposition ; the central divisions of the dentinal tubuli were well exposed ; contrast was made by comparing it with another tooth to match the color, so that the shade could be determined. Cavity packed with absorbent cotton ; rubber-dam adjusted, and the roots of the tooth imbedded in a piece of beef meat. Cotton was tightly wound about the platinum wire, constituting the positive electrode ; the negative was another wire inserted into the beef about one inch away from the imbedded tooth.

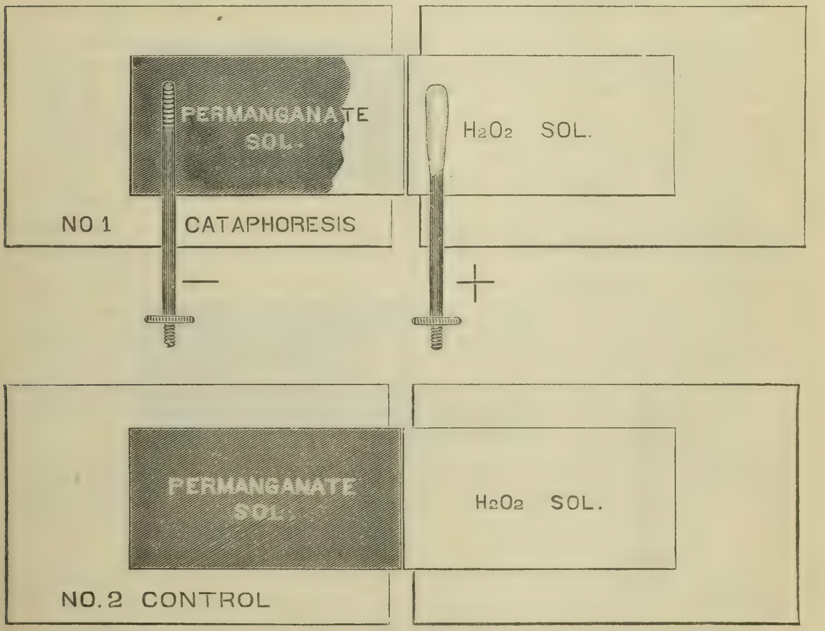
Solution of chlorid of sodium two-fifths of a cubic centimeter, and one and three-fifths cubic centimeter of $H_2O_2$ twenty-five per cent., water seventy-five per cent., made by shaking two parts of pyrozone twenty-five per cent. solution with one part of water and separating the fluids in a funnel, was dropped onto the cotton with a pipette ; the current was turned on and very quickly dried it, which was indicated promptly by the fall of needle of the milliamperemeter, and more solution was continuously added. The darkened portion of the tooth bleached perceptibly white within a minute ; current strength twenty-five milliamperes. Then about the same number of milliamperes was employed during five minutes ; enamel perfectly bleached. The bleaching action was also evident at the ends of the roots of the tooth, the $H_2O_2$ having been conveyed there by way of the open pulp-canals. These latter, therefore, in actual practice, if exposed should be closed by a non-conducting cement.

*Experiment 12.*—Two pieces of blotting-paper, 1 x 2 inches, each laid on a glass plate, and six bars of blue litmus-paper laid across the blotting-paper thus :



Two cubic centimeters of twenty-five per cent. aqueous solution $H_2O_2$, applied on glass at end of blotting-paper ; fifty milliamperes current. Blotting-paper wet with a weak solution of chlorid of sodium ; current turned on. Almost immediately in No. 1 the litmus-paper at the positive end began to bleach, and this bleaching progressed in perceptible steps toward the center until within four and one-half minutes the litmus-paper on the positive end (three bars of it) was completely bleached of its blue color. The control experiment showed no change, proving that ordinary diffusion or chemical osmosis was not the cause of the result obtained in No. 1.

*Experiment 13.*—Four pieces of blotting-paper, 1 x 2 inches, two pieces saturated with a decinormal solution of permanganate of potassium, U.S.P.—this stained them a chocolate color; two pieces saturated with twenty-five per cent. aqueous solution of $H_2O_2$. Each piece of permanganate paper was brought into juxtaposition with each piece of $H_2O_2$ paper. No. 1 for cataphoresis; No. 2 for control (see illustration).

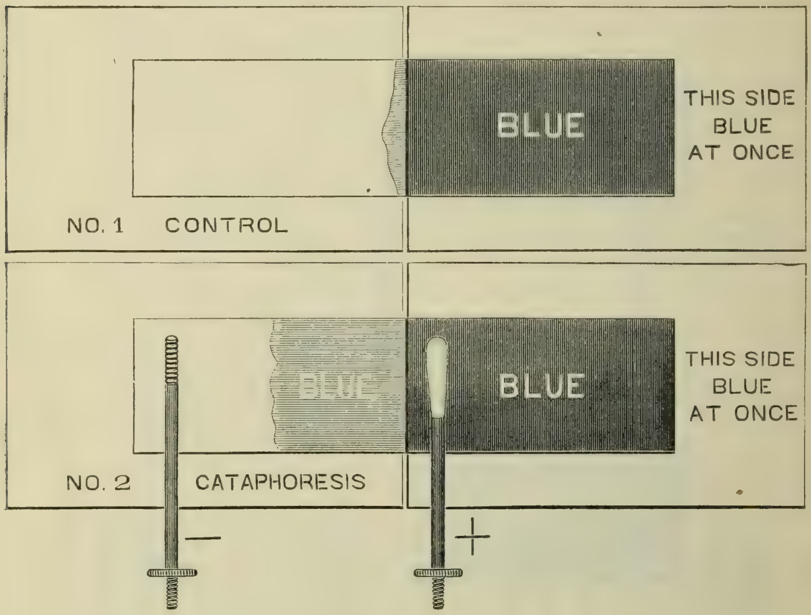


The $H_2O_2$ pieces of blotting-paper were previously moistened with a solution of sulfate of soda; fifty milliamperes of current strength were applied as indicated by the platinum electrodes in the illustration. The encroachment of decolorization of the permanganate paper was noticed at once in No. 1; it progressed steadily, and at the end of five minutes had extended about one-third of an inch, thus proving cataphoric action, while the control, namely No. 2, showed but a trifling decoloration at the point of immediate contact.

*Experiment 22.*—Four pieces of blotting-paper, each one 1 x 2 inches, were laid in pairs upon glass plates, so that the edges of each pair could be brought into contact. The blotting-paper was wet with a solution of sulfate of soda. Then four pieces of ozone test-paper of about the same size were laid upon the pieces of blotting-paper, the ozone paper in this way becoming slightly moist with the solution beneath it. This white ozone paper gives a bright blue reaction to $H_2O_2$.

See illustration, showing in No. 1 the control experiment, and in No. 2 the cataphoric effect which occurred, placing pyrozone, twenty-five per cent. solution ethereal, upon the right-hand papers. These, of course, were immediately colored blue. The pieces of glass were now so moved as to permit the pieces of paper to touch, and in No. 2 the current was turned on up to fifty milliamperes.

The result was most striking and most conclusive, for the $H_2O_2$ solution under the electric influence straightway began to invade the previously white paper and colored it blue for half of the distance toward the negative electrode, while in the control experiment little or no blue color was produced upon the white paper, except for a trifling distance from the point of contact.



## CONCLUSIONS.

1. Cataphoric action is a demonstrable property of the galvanic or continuous current.

2. The negative pole must be placed at some part of the body comparatively distant from the tooth, for instance the cheek, hand, back, or breast.

3. The pulp-canals, if exposed, should be closed by a non-conducting cement.

4. Solutions for cataphoric action should, if spirituous, aqueous, or with glycerol, be associated with some substance which makes them better conductors of electricity.

5. Experiment 22 teaches this most important fact, namely, that while ethereal solutions of $H_2O_2$ do not conduct electricity, and cannot therefore be used by themselves for cataphoric action, still this effect can be readily obtained when the porous material which holds such an ethereal solution has been previously moistened with a solution of sulfate of soda or some similar conductor.

6. The efficacy of bleaching agencies, as, for instance, $H_2O_2$ solutions, is greatly enhanced by the concomitant aid of electricity, namely, by cataphoresis.

# TWO CASES OF INFANTILE SCORBUTUS.

BY EDWARD C. KIRK, D.D.S., PHILADELPHIA, PA.

(Read before the First District Dental Society of the State of New York, March 12, 1895.)

MR. PRESIDENT AND GENTLEMEN: It may be, perhaps, that maladies connected with infant dentition rarely fall under the notice of the dental practitioner; but as dentists are occasionally consulted with reference to such matters, it is well for us to take advantage of any opportunity which may offer for a study of this important field, and which, all things considered, is, or should be, a part of our legitimate domain of practice. The etiology, pathology, and therapeusis of aberrations from the normal process of dentition, and the conditions modifying the physiological proruption of the first set of teeth, are not only of great importance in themselves, but also as related to the integrity of the oral conditions later in life. It has been urged that the treatment of pathological conditions incident to the first dentition had best be left to the care of the medical attendant. A somewhat extensive experience in this relation leads me to the belief that the average medical practitioner is as well versed in this field as he is in the treatment of oral conditions in general, no more, no less. On the other hand, the principles governing the treatment of pathological conditions of the infant oral cavity are closely in harmony with those pertaining to the adult mouth, and there seems to be no valid reason why such cases should not properly come within the sphere of dental practice. A cultivation of the already noticeable tendency in this direction is desirable, and will be greatly enhanced when the dental practitioner is more thoroughly trained in this department, and the fact becomes generally recognized that he is fully competent to deal with that phase of his specialty.

There was recently presented for the consideration of this society, a most admirable and highly suggestive paper by Dr. Stowell on "Diet and Local Exercise in Relation to the Teeth," in which he called attention to the deleterious effects upon the teeth of the continued use of the proprietary foods for the feeding of infants. The paper was one of great interest to me, as I have been studying for years with especial care a number of cases of complete decalcification of the primary denture in which a common factor has been the habitual use of this class of preparations. I have seen several such cases where decalcification of the six upper front teeth had progressed until nothing but the organic matrix of the tooth remained as a spongy flexible mass, which subsequently succumbed to rapid disintegration. The saliva in these cases was found to be constantly acid. The children were usually highly nervous and irritable, markedly cachectic, and prone to catarrhal inflammatory troubles. I have been able to effect a marked improvement in a few instances, so far as the systemic conditions are concerned, by suggesting a wholesome, nutritious, and varied diet, with out-door exercise and intelligent hygienic care. Where such directions have been faithfully carried out, the second dentition has been most satisfactory, the condition of the oral secretions has become normal, and the carious tendency was but slight or hardly noticeable.

It is important to note that when the oral conditions to which I have alluded prevailed, an inordinate amount of saccharine matter was given either in the form of candy or sugar, or with the food. The diet embraced some of the following materials: Condensed milk, with its excess of sugar as a preservative, Mellin's Food, Malted Milk, Lactated Food, Nestlé's Milk Food, and similar preparations always sweetened with sugar; sweet biscuit, cakes, etc. There can be no question as to the deleterious effect of the continued use of a diet of this character upon tooth-structure, especially that of the primary denture, with its relatively inferior powers of resistance to chemical action. It is not necessary to more than call your attention to this phase of the subject, as the reasons for the destructive action of this class of dietetic articles upon the teeth are matters of common knowledge in dentistry. There is, however, an important side to this matter of infant nutrition, not by any means so clearly manifest, but which careful investigation will, I think, prove to be a definite outgrowth of the pernicious custom of *depending altogether* upon proprietary and chemical-laboratory food products for the nourishment of infants. I refer to the systemic nutritional disorders so often produced by this custom. Disorders of the digestive tract, with their sequelæ, are sufficiently familiar; they not only give rise to a number of acute or chronic pathological conditions, but indirectly bring about impairment of nutrition through the inability to properly prepare and assimilate food. This train of evils can be shown to be more closely connected with the indiscriminate use of artificially prepared foods in many instances than the proprietors of the preparations would be willing to admit. But a special feature which constitutes an important objection to the habitual use of these preparations is one which directly affects the nutritional process,—viz, their inadequacy to supply all the elements necessary for the normal nutrition of the individual.

Two closely allied conditions directly due to imperfect nutrition, from lack of essential food elements, are rickets and scorbutus. It is to the latter condition that I wish to call your attention. Scurvy in the adult is, in recent times, practically an unheard-of disease. The compulsory use of antiscorbutic dietaries in the army and navy, prisons, reformatories, and other institutions where the disorder was prone to occur, has been successful in stamping it out; so that its occurrence is now conditioned by unusual circumstances, affecting single individuals rather than large groups or communities. While its etiology has been pretty clearly made out as a condition of imperfect nutrition, the precise nature of the morbid process has remained more or less obscure. That certain alterations in the character of the blood occurred in scorbutic patients was shown from the investigations of Busk and Garrod. The former found, from a series of analyses, that there was a considerable diminution in the number of red corpuscles, an increase in the amount of fibrin and albumin, and no decrease in the amount of potash salts. Dr. Garrod observed that in scorbutic diets, potash existed in smaller quantities than in antiscorbutic ones, and was led to determine the amount of that substance in the blood and urine of a patient suffering from scurvy, and he found it considerably diminished. From this observation he brought forward the theory, that scurvy depended upon a deficiency of potash in the system.

The fact that potash is diminished in the urine of patients suffering from scurvy has been confirmed by Ralfe and others. Dr. Harry Leach, from whose article on the subject I have made the foregoing quotation, states in regard to Garrod's observation that "it is doubtful whether the disease is produced by a deficiency of potash in the system, since the administration of large quantities of beef tea containing more potash than in the ordinary antiscorbutic dietary of the Seamen's Hospital fails to exercise a curative effect, and it is not till the patient obtains lime-juice or potato that he recovers. Dr. Buzzard considers that although the organic acids and potash separately do not represent the requisite material, it is to be found in the chemical combination of the acid and the base." Whatever may be the exact nature of the deficiency in the nutritional elements of a scorbutic dietary as compared with antiscorbutic foods, there can be no question that some essential nutritive element is lacking in the former, and that it is this lack alone which is the cause of the disorder under consideration. This conclusion is a logical deduction from the repeatedly observed facts that the disease is produced by the continued use of one class of foods, and is rapidly and permanently cured by the substitution of another class.

About six years ago I was asked by the late Dr. J. W. White to see a case under his care which presented a remarkable and unusual condition of the gums. The patient was an infant girl of about ten months, the child of well-to-do parents, surrounded by all the conveniences and comforts of living that ample means and intelligence could procure. The child had been weaned at about two months, owing to some imperfection in the quality of the mother's milk, and had been artificially fed with great care under intelligent medical direction from that period. A short time before I saw the case, about two or three weeks as I now recollect it, the child had shown symptoms of ill health, becoming pale, somewhat emaciated, restless and irritable, especially at night, with a tendency to cry out in its sleep, which was more or less broken and fitful. Later, the mother noticed a marked loss of power in the lower limbs, which at first the attending physicians were inclined to regard as a mere fancy on the part of the anxious mother, but the observation was later confirmed, when almost total motor paralysis of the lower limbs ensued; there was, however, apparently no loss of sensation. There were no pathological manifestations upon the skin, swellings or ecchymoses upon any part of the body, so far as I could learn. An examination of the mouth revealed a most distressing state of affairs. The incisors of both jaws were fully erupted, and were apparently standing in their alveoli without the least particle of attachment of gum to them. The gingival border had receded from the teeth for at least a line in distance, and presented a thickened necrotic edge, highly vascular, and bleeding at the slightest touch. Over the position of each of the first molars was a vascular tumor, the size of half a cherry, and it in fact closely resembled one of the small and dark colored cherries in appearance. Upon passing a bistoury into these vascular tumors, a considerable flow of dark, apparently disorganized blood took place, and the erupting molar could be felt, and later seen at the bottom of the spongy vascular mass which surrounded it. The bone of the alveolar border surrounding the incisors was denuded so that it could be distinctly seen, and felt with an instrument. The teeth were so loose that it seemed almost certain that they would soon be thrown out of their sockets from loss of their attachment. The case had been examined by a number of the most experienced and reliable physicians of Philadelphia, without having arrived at a satisfactory diagnosis, and the treatment was largely upon the expectant plan, with the endeavor to combat the several pathological manifestations as they arose. One specialist had diagnosed the case as purpura, another as of metallic poisoning. The former diagnosis was found to be erroneous because none of the general symptoms of the disease subsequently developed, while the mouth conditions grew gradually worse.

Acting on the suggestion of metallic poisoning, analyses of the milk, water, and all the food-materials used, were made with negative results. Porcelain and glass vessels were exclusively used in the preparation of the food. I found that the rubber nipple used upon the feeding-bottle was of the red or maroon color so frequently seen, and I sent one of the nipples to a competent chemist for analysis, thinking that it might be the source of contamination. It was found that antimony sulfid was the coloring matter, and there was absence of arsenic, mercury, and lead. I was inclined to suspect the antimony as a cause, and had the red nursing-nipples discarded for black. No change, however, resulted in the mouth condition of the child. Antiseptic washes were used in connection with stimulating applications in the local treatment of the oral conditions.

After all available resources had been exhausted without benefit, Dr. White decided upon general principles, and as a last resort, to make an entire change in the environment of the child. It was, although in an almost moribund condition, transferred to Atlantic City, and began to show improvement; its diet was changed somewhat, though in just what particulars I am unable to state, and the child went on gradually to complete recovery.

Two further items bearing upon the case should be noted. Just before its removal to Atlantic City, Dr. White became impressed with the belief that the disease was scorbutus, and acting on this, the child was given small doses of a mixture of lemon and onion-juice as an antiscorbutic. This was found to increase the disturbance of the bowels so decidedly, that it was abandoned, at least temporarily. Whether the theory of the scorbutic nature of the disorder was adhered to by Dr. White, I am unable to state, and my belief is that he afterward abandoned it, owing to a discovery bearing on the problem which was subsequently made, viz, that the house occupied by the parents of the child since its birth was filled with sewer gas, owing to very defective plumbing. This fact made so profound an impression upon all concerned, and especially when taken in connection with the improvement in the child when sent to Atlantic City, that the explanation of the disorder as of septic origin seemed satisfactory at the time. Recent developments have, however, led me to regard the case, which I have detailed at some length, not as one of septic infection, but as a fairly typical case of infantile scorbutus.

I am led to this view from having recently studied an almost exactly similar case, where there was no possible chance of septic infection from imperfect plumbing as a cause, and where the institution of an antiscorbutic treatment resulted in an almost immediate improvement and rapid recovery. I referred to this case at, I think, the December meeting of this society, calling attention to the peculiar hemorrhagic tumors which I found growing over the position of the first molars in an infant, the child of patients of mine. I recognized at once the similarity between the oral conditions presented in this case and the one I have previously described. The similarity became closer as the disorder progressed. The gum-tissues around the incisors of each jaw became rapidly involved, until the alveolar border was exposed. The onset of the attack in the incisor region was sudden. There appeared in less than two days a large, pendulous, dark red, vascular tumor from the palatal gingival border of the superior incisors, which hung down below their cutting-edges, and interfered with closure of the jaws. A corresponding mass developed in relation to the lower incisors. It was noticeable in this case that areas of ecchymosis of varying size, dark red in color, very much like what we commonly know as "blood blister," excepting that they were only slightly elevated above the surrounding gum-tissue, appeared at points not connected with the erupting or erupted teeth. I mention this point because nearly all writers state that the sponginess and vascularity of the gum-tissue occurs only in connection with teeth, and is not seen in edentulous mouths.

This patient was given local treatment, similar in therapeutic principle to the former one ; and one morning, while making a comparative study of these two extremely puzzling cases and reviewing their points of correspondence, I received a note from the attending physician to the effect that he could not rid himself of the suspicion that the case presented scorbutic features. Acting upon this idea, which was so fully in harmony with the view at one time held by Dr. White in his case, I suggested to the mother, at my visit that afternoon, to give the child orange-juice in liberal quantities. The family physician, Dr. John H. Musser, added to this the direction to give the child the pulp of sound, ripe, white grapes. In addition to this, beef-juice, rare meat shredded, milk, potato, etc. The change was rapid and wonderful. The mouth-trouble subsided quickly, and the whole systemic condition became normal. The child had been fed almost exclusively on proprietary foods.

I made a careful examination of the patient's surface and found a few ecchymosed spots, but not of intense color, and only limited area. There was no development of motor paralysis that I could determine. There was, during a portion of the time, a well-defined condition of enuresis, with excessive flow of urine. The irritability and fretfulness of the child at night was especially marked,—he would awaken and cry out as if attacked with sudden paroxysms of pain. The rapidity of recovery under an antiscorbutic dietary, the mouth manifestations, the ecchymoses upon the skin, and the lack of correspondence of this group of symptoms to other known disorders, seem to justify the diagnosis made.

In a most able and interesting lecture by Dr. Thomas Barlow, physician to University College Hospital and the Hospital for Sick Children, London, the clinical phenomena of infantile scorbutus are most exhaustively set forth, and its differential diagnosis from other disorders most clearly presented ; Dr. Barlow's paper, which is published in the *Lancet*, November 10, 1894, is one which I can assure you will repay careful study. He states among other important points, with respect to the food question, that the problem is possibly biological as well as chemical. The farther we get away from living food, the less is its antiscorbutic power.

In the series of cases so far observed, it is stated that in no single instance at the time of the onset of the malady has the child been breast fed. In the great majority where complete details have been obtained, these infants have been found to have been nourished upon what may be called preserved foods. In the treatment of the profound anemia, fatty degeneration, etc., resulting from the disorder Dr. Barlow says, "Experience has abundantly shown that blood tonics such as iron, arsenic, and phosphorus are useless, if the proper change is not made in the diet ; and if the proper change is made they are scarcely necessary." Infantile scorbutus appears to be a disease affecting the children of those who are well-to-do. Dr. Barlow says, "Of the thirty-three typical examples which have come under my notice since 1883, only six were hospital cases. The others were children of well-to-do people, with healthy surroundings and good homes. There was nothing to suggest either wilful neglect or faulty hygiene in any gross sense." Both Dr. Barlow and Dr. Northrup, physician to the New York Foundling Hospital, believe that the disease is on the increase. The former states that both in England and America there is to be noted an increasing difficulty in getting mothers to suckle their infants, and there has been an enormous increase in the employment of proprietary infant foods. These foods are used much more extensively among the well-to-do than among the poor. The children of the latter receive, at a much earlier period, small portions of the food of which their parents partake. The authorities on the subject do not condemn the use of proprietary foods in toto, but the habitual use of these preparations, to the exclusion of other articles of diet. In general a varied diet, after whole milk has been found to be insufficient, is what is needed.

It is not my intention to go into a consideration of dietetics, but merely to indicate the main points in relation to this peculiar disease, which, if we are to accept the teachings of those who should know, is growing more common, and as a consequence more likely to be met with by dental practitioners. It was with the hope of directing your attention to the matter, so that the subject would not be altogether unfamiliar should you meet with an example of the disease, that I have taken the liberty to present this account for your consideration.

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# THE SCIENTIFIC SPIRIT AND THE ETHICS OF DENTAL PRACTICE.

BY DR. C. J. ESSIG, PHILADELPHIA, PA.

(Read before the Academy of Stomatology, April 23, 1895.)

"THE individual," some one has said, "is a puzzle ; in the aggregate he becomes a mathematical certainty. You cannot foretell what one man will do, but you can say with precision what an average number will be up to." In no calling is this more conspicuously true than in the dental profession ; its rapid advancement, its triumphs and scientific spirit, very justly entitle it to the admiration and pride of its members. Yet among dentists it is often asserted that there is no *esprit de corps*, and the frequent instances of disregard of the code of ethics on the part of individuals, and the unscientific spirit in which many of them view the lesions of the organs which it is their specialty to treat, make a bold contrast between the high aims of the profession as a whole, and the practice of a large number of its members.

In our societies, current literature, and colleges, in the free and liberal professional intercourse which has been steadily growing for more than a generation, may be found the most gratifying improvement over the time when the tendency was to conceal every invention, device, or detail of practice, as the miser does his gold.

It cannot be denied, however, that *esprit de corps*, which is the "chivalry" of professional life, is often forgotten, and the code of ethics which should be our guidance in all intercourse, both with patient and professional brother, is as often ignored as observed. Yet we should be far from attributing every violation of the strict interpretation of the code of ethics to a want of honor or to greed ; much of it is, no doubt, due to absence of the scientific spirit which should guide the practitioner in the treatment of the dental organs.

The word "scientific" is often used by dentists in their writings and discussions, and they not infrequently misapply the term. Dentistry as practiced is an art, even when the practitioner considers his filling-materials as therapeutic agents ; therapeutics being, itself, essentially the art of medicine. A science teaches us to know, an art to do ; with the light, then, which a knowledge of the so-called medical sciences sheds upon what we do, our work should be better done, and with greater uniformity in methods and results than has yet been attained in the prevention or treatment of dental caries.

The remarkable want of concordance in diagnosis and in treatment in dental practice ; the absence of *esprit de corps* and indifference to the ethics of questions of judgment between dentists, especially when, as is too often the case, the patient is made a party to controversies growing out of difference in treatment, has undoubtedly been a serious injury to our profession in the estimation of the public. The dental profession cannot hope to gain or to hold the highest respect of the people while its individuals exhibit the ethics of the artisan.

This fault comes to us from a variety of causes. Primarily we get it as an inheritance from predecessors who flourished previous to the advent of dental colleges ; they were often mere mechanics, without knowledge of the medical sciences, and their unwritten ethics were those of the artisan. Another cause may be found in the fact that filling teeth with gold is artistic in character, requiring the artist's instinct in its performance. The practitioner is thus lured from the scientific aspect of his specialty, which otherwise might stimulate him to find, in the realms of preventive medicine, lines of treatment of a higher order than the merely mechanical and often unsatisfactory one of filling carious cavities with gold, amalgam, or the "plastics." Another cause, which is now happily growing less every year, may be found in the fact that many recruits enter the ranks of the dental profession after having passed a portion of their earlier lives in commercial pursuits, and they bring with them the ethics and ideas of the shop, where the ability to sell often consists in the power to underestimate the wares of a rival. Such men are not likely to get beyond the idea of mechanical achievement in the treatment of dental organs.

Every dentist owes something to his profession, which freely lays its treasures at his feet ; and if he is not endowed with sufficient self-respect to avoid practices which will dishonor him, he should be compelled to respect that profession whose sheltering wings include him in their fold, and whose fair fame may be smirched by every mean act of his professional life.

I was asked not long since by a legal gentleman, the question, "Is there no *esprit de corps* in your profession?" Said he, "A relative of mine whose teeth had just been examined by a dentist of high standing and pronounced in good order, called upon another member of your profession in a neighboring town who claims to have found a large amount of work to be done, and has so shaken the confidence of my relative that he and some of his family have left their family dentist. Now," said he, "if this incident merely indicates an honest difference of judgment, then there must be some serious defect in your system of professional education ; but if this difference of opinion is, as I suppose, actuated by a commercial spirit, there should be a penalty made to follow such unprofessional conduct severe enough to make it unprofitable for him to repeat it."

I have heard incidentally of a case which occurred recently of a dentist who made an examination of fillings done by a previous dentist in the presence of two of the patient's relatives, pointing out alleged defects, and using other arguments to destroy the confidence which they had felt for many years in their family dentist. I was asked by the lady who related this circumstance to me, "Does your profession allow such conduct?" I replied that "our profession prescribed for its members a code of ethics for their guidance, but that no written 'code' could make a gentleman of an individual who was not so naturally or by training."

A gentleman asked me recently for an opinion about the case of an acquaintance who had his teeth examined by a dentist who told him that it would take six weeks to put them in order ; he kept appointments every day for three weeks, when, getting "a little tired," he asked the dentist how much more remained to be done, and was told, "I am about half through." "Well," said the patient, "I think I will stop for a while." But soon after that he had occasion to consult another practitioner, who, after an examination, told him that with the exception of trifling repairs needed by one tooth, his teeth were in perfect order. I preferred not to characterize this remarkable difference of opinion, but presuming that the incident was one of an honest difference of judgment between two professional men of equal intelligence, skill, and training, how may we account for such diagnostic uncertainty? The public is, I believe, more and more coming to attribute such differences to the commercial spirit, and thus our profession is, to a certain extent, made to rest under a stigma.

Viewing dentistry as a branch of the healing art, examinations made to determine which teeth are carious and in need of treatment correspond to diagnosis in medicine, being, however, much simpler in character and easier to determine ; yet medical diagnosis has become almost an exact science, while dental diagnosis among a very large number of educated and prominent individuals, often making pretentious claims to high professional attainment, remains so uncertain that it must inevitably bring distrust and ridicule upon our profession.

An example of individual disregard for professional ethics, and of the greed which often overrides every other consideration, was related to me by one of my patients, who stated that her sister's dentist had removed every filling in her mouth done by her two preceding dentists, and is now removing his own fillings.

The use of gutta-percha and other plastic filling-materials affords the unscrupulous individual his best opportunity for unprofessional criticism. A dentist who has been in continuous practice for more than half a century recently remarked to me, that "the most discouraging feature which he had met with in practice was to be found in those cases in which he had endeavored to save the soft and inferior teeth of early childhood by filling with gutta-percha and other plastic materials, and just when the age had been reached when sufficient improvement in the quality of such teeth seemed to warrant the use of gold with some degree of permanency, they would fall into the hands of some other dentist, presumably through loss of confidence in the family dentist ; for some patients think that unless gold is used from the first as a filling-material we have not used our best efforts, and will seek the services of some one else, who, perhaps, will be only too ready to encourage the waning confidence in his professional brother. It is in just such cases that the individual finds his most prolific opportunity ; he gets a patient of fifteen or sixteen years of age in whose mouth during early childhood the teeth were of the frailest character, in some cases, perhaps, showing decalcification of the enamel on the labial surfaces of both upper and lower incisors. No class of cases causes the honest practitioner more anxiety than do these ; it would seem almost like malpractice to attempt to bridge over that precarious period of early dentition with any other of our too few and often unsatisfactory filling-materials than gutta-percha. But if the patient is unlucky enough to get into the hands of a man who habitually ignores the ethical side of cases, he frowns, looks unutterable things, condemns the earlier treatment, and fills with gold, the very thing he found the dentist would have done at that time had the patient remained in his charge, for by the fifteenth to the seventeenth year the teeth often show great improvement, and sometimes the tendency to decay at that age will have entirely disappeared.

Ten years ago one of my young patients who had teeth of the frailest character, so frail indeed that up to his fourteenth year I believed that I could better arrest the progress of decay by the use of gutta-percha, got into the hands of a dentist at one of the fashionable watering places who, between himself and his assistant, after much severe and outspoken criticism, replaced all the gutta-percha fillings with very inferior gold ones ; yet that individual has, I believe, on more than one occasion, publicly advocated the gutta-percha as a preliminary filling-material in "children's teeth of the frailest class."

Three or four years ago a striking instance of individual disregard for the code of ethics which our profession prescribes for its members came to my knowledge in the case of a young miss, whose teeth were of very inferior quality, and for whom, up to her fifteenth year, I did not have to use any other filling-material than gutta-percha. Having some discomfort with a very frail upper molar, she was taken, in my absence during the summer vacation, to another dentist, who extracted the first molar, and with many expressions of horror hastened to replace with gold what gutta-percha fillings he found in the front teeth. Now, it happened that in this case I had special reasons for wishing to preserve the first superior molar on account of a flat appearance of the face, which I feared would be greatly increased by the loss of the molar teeth, but when I again saw the patient in the autumn the mischief had been done; the scientific idea, which should have governed in the treatment of the case, had given place to the spirit of greed. The loss of the molar with the subsequent increased flattening of the face, and the change in the center line, was a matter of much regret to the child's parents, who were in no way responsible for the unwarrantable interference of the dentist, to whom the child was taken for some trifling repair to the tooth which was extracted.

Seventeen years ago I made an examination of the teeth of a lad of nineteen. I found a full denture of superior quality, without caries, and so informed the boy's mother, at which she expressed surprise, and told me that within ten days her son's teeth had been examined by a dentist who recorded as a result of that examination "twenty small cavities." That patient is now thirty-six years of age. I have examined his teeth every six months since, and he has at present only two small gold fillings in his mouth. In this case I would not like to attribute the defect in the first diagnosis to other than one of judgment, but the patient becomes, necessarily, a party to the question, and whether the verdict of the public is that such remarkable differences are merely matters of opinion or exhibitions of the commercial spirit, the effect is equally discrediting to the dental profession as a whole.

Now, it may be asked, have you not overestimated this matter? Have you not cited a few exceptional cases? And do not other professions do these things, too? I believe that violations of the code of ethics are practiced to a greater extent than I have herein pictured. I have not selected as examples of this disagreeable feature of our profession a few exceptional cases. I have presented what I believe to be a few typical cases of practices which we all know do exist.

It cannot be denied that other professions have their "black sheep," and that habitual violations of the "code" to a certain extent are practiced in the medical profession; but they are not as outspoken or as flagrant, and are confined more to the lower stratum of its members than they are in the dental profession, and are more severely dealt with when detected.

I imagine the remedy for abuses, which have doubtless greatly retarded free and full association among dentists and to a certain extent lessened the confidence of the public in our profession, will be found not so much in the arraignment of individuals as in improvement of methods. We still estimate gold as the best material for filling teeth, yet it is a significant fact that the best examples of gold fillings are seen in the teeth of young adults or those who have passed the age when fillings are most imperatively needed, and that gold is often the most unfit material with which to arrest caries of the frail teeth, particularly those of early childhood, at the very time when effective measures are most demanded.

Neither from the prophylactic nor therapeutic standpoints has dental caries been sufficiently studied as a disease. Dentists have been so engrossed in the artistic treatment of the teeth and the development of mechanical appliances that a rational systemic treatment has been almost entirely overlooked. Caries of the teeth may with as much propriety be considered a disease as is "Bright's" or any other lesion affecting the different organs of the body, yet any of these may be controlled or cured by medicinal or hygienic treatment.

A properly regulated diet, with systematic physical exercise for the purpose of promoting assimilation to the extent demanded by nature for a normal condition of all the organs of the body, would do much to control and even cure dental caries. Many of our young patients have really no physiological right to have teeth, so perverted are the nutritive functions of their bodies. Does it not then seem that a more rational treatment would consist in a hygienic system which would so build up the tooth-structure that it would be capable of retaining the mechanical stopping over which we spend so much time, skill, and patience, and that would reduce the chances of a recurrence of caries to a minimum?

In the fact that the field hands among the southern negroes have exceptionally fine teeth, while the house servants show rapid deterioration of the dental organs, and in the superiority of quality of the teeth of the laboring classes of Europe over those of the non-laboring residents of the cities, may be found significant and useful hints in the treatment of these organs.

In addition to a well-thought-out systemic treatment, a filling-material is needed which shall require less time and skill in its application than does gold, and which when applied shall possess the qualities of impermeability, insolubility, and a close resemblance to the enamel and dentine of the natural tooth; be non-conductive o thermal changes, and, above all, one that can be inserted in a plastic state, with the ability to fully harden afterward.

That both of these improvements in the treatment of diseases of the teeth will eventually come I do not for a moment doubt; and when they do, the scientific spirit will, it is to be hoped, take the place of the idea which leads so many dentists to believe that a well-finished gold filling is, *per se*, the highest aim of conservative dentistry.

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# A CASE OF NASAL PROSTHESIS.

BY DR. M. W. HOLLINGSWORTH, SANTA BARBARA, CAL.

WHILE it may not be considered within the province of dentistry to make and adjust an artificial nose independent of an obturator, it is nevertheless quite within the domain of mechanical dentistry to supply a deficiency of this character by the use of such materials and devices as are possessed by the average practitioner. Experience

FIG. 1.

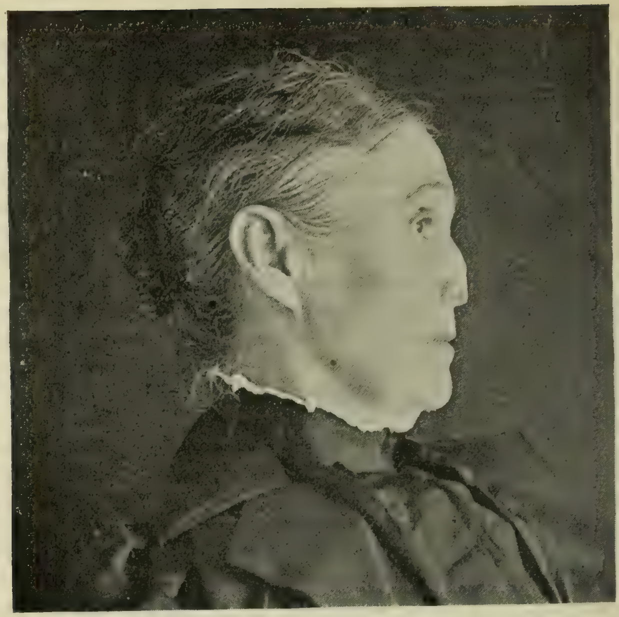
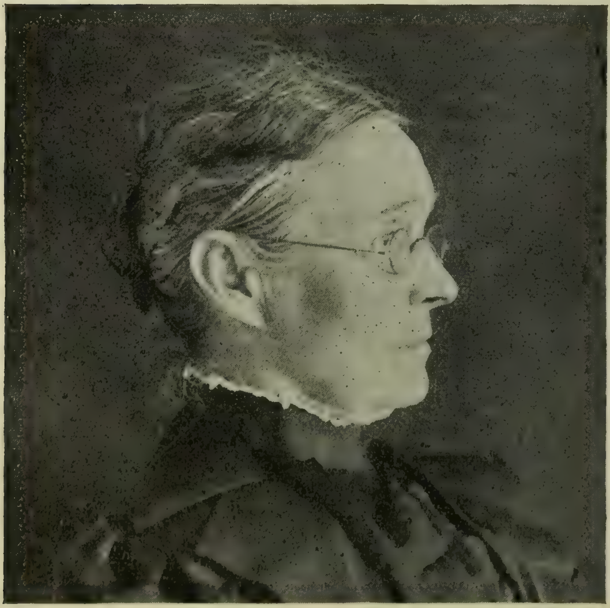


FIG. 2.



warrants the statement that work of this nature demands no greater skill, artistic or manipulative ability, than that required in the construction of crowns, bridges, or work of like character in general practice. It was, nevertheless, with a feeling of doubt that I undertook the case under consideration ; but the comparative simplicity, the success, and the perfect satisfaction of the work performed induces me to give to the profession at large the benefit, through the DENTAL COSMOS, of the experience thus gained.

The case presented was that of an old lady who had been afflicted with a cancerous growth which resulted in the loss—by a surgical operation—of the greater portion of her nose, leaving seemingly healthy tissue. On account, however, of her age, and the fear of a recurrence of the disease, she was deterred from resorting to plastic operation for restoration. As is observable in the illustration, the loss was confined to the cartilaginous portion embraced within lines which might be drawn from the upper termination of the septum articulating with the bony structure, downward on either side of the median line, to a point midway between the lower lateral cartilages and the cartilages of the nose, which were without power of muscular dilatation. The greater portion of the septum remained intact.

My first effort was to obtain a complete reproduction or model in plaster, without distortion ; and in order to obtain this it was necessary to give reliable inner support to the wings of the nostrils, to counteract pressure from the weight of plaster used to obtain the conformation of external surface. For this purpose well-softened modelling compound was first used and applied upon the end of a pine stick, especially formed and of convenient length. Pressed well up into each air-passage, the compound yielded a fairly accurate impress of the inner walls, but was destined to serve only as a vehicle for the ever-reliable plaster-of-Paris, for which room was made by slightly trimming the surface of the compound upon removal. The nostrils being well oiled and otherwise prepared to prevent adhesion, the modelling-compound forms, coated with plaster of creamy consistency, were again inserted, the plaster admitting of reaction from possible distortion, before hardening. After the impressions were thus obtained, the projecting ends of the pine sticks were removed close to the nose, in order to prevent distortion by leverage. The wings of the nostrils being now supported from within, the external surface was thickly coated with plaster on one side, from cheek to median line, leaving a grooved perpendicular wall. This was shellacked and oiled in order to insure easy separation from a similar coating upon the other side. When well hardened, the lower extremity of the mask thus formed was surfaced, grooved, and otherwise prepared for the lower section, covering the ends of the two upper sections, as well as the forms in the nostrils, and embracing also a portion of the lip. The three sections were then removed inversely to the order in which they were applied, and again put together and prepared to receive plaster for the cast. The intro-nasal forms were preserved for future use

After determining the individuality of the natural nose, from photograph and otherwise, I proceeded to build out and form in wax upon the cast a model of the artificial substitute, the manner of attaching which now demanded attention. As external methods were, as far as possible, to be avoided for obvious reasons, preparation was now made for internal support. Here I was confronted with the question of obstruction of air-passages. Naturally, this was to be avoided by properly constructed tubes, for which gold was used, formed in the following manner: Use was made of the intronasal forms, as models from which to obtain metallic castings upon which the tubes were to be contoured. In order to prevent irritation, the edges of the upper and lower ends of the tubes were turned inward, thus leaving the terminations slightly rounded. To the upper surface of each tube, on the septum side, were soldered strips of gold extending outward, to act as tangs for attachment. These tangs, bent inward, close up to the septum, formed a bridge over it when soldered together, the manner of obtaining the proper relative positions for which was as follows:

The tubes were placed in proper position, and, by the aid of a small pair of tongs suitable for the purpose, each was pressed toward the septum, and, while in this position, a small quantity of plaster was placed around the projecting tangs and allowed to harden, when all was removed. This done, the tubes were sufficiently imbedded in sand and plaster to admit of soldering. The ends of the tangs remaining unsoldered were bent over right and left, at a proper distance from the tubes, in order to form an anchor-head required for the vulcanite attachment.

The previously prepared wax model was now applied to the nose and secured to the anchor-head in proper relative position, with the aid of a small quantity of plaster. When safely removed, the familiar process of enflasking was next in order, and, with tubes uppermost, the nose was imbedded to the margins of external surfaces, the tubes and the inner surface of wax remaining exposed for the upper half of the flask. Packed with rubber of proper or approximate color, the flask was placed in the vulcanizer. But little surfacing was needed in the process of finishing, as flesh tints in oil colors were yet to be applied, and a glossy surface was not desirable. All excess of rubber was removed from inside of the nose close up to the anchor-head of the tubes, thus leaving a light and strong shell. When the two or three coats of paint were applied and thoroughly dried, glossiness was reduced by slightly rubbing the surface with pumice.

As will be seen in the profile view of the finished work, the upper edge of the nose is held in position by small spring-wire attachment to the spectacles.

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# PROCEEDINGS OF SOCIETIES.

## FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a regular monthly meeting Tuesday evening, March 12, 1895, at the New York Academy of Medicine, No. 17 West Forty-third street; the president, Dr. V. H. Jackson, in the chair.

### INCIDENTS OF OFFICE PRACTICE.

Dr. LEWIS N. SHIELDS. I desire to make a statement in regard to the electric mallet while its inventor, Dr. Bonwill, is here. This mallet was a fine piece of mechanism when we first bought it, but after using it for a while we found that it would occasionally get out of order. We tried to discover for ourselves what caused the trouble. We ruined several mallets in studying their construction, and spent a great deal of money experimenting with the different batteries, and finally we determined the cause and were able to correct it, but it took us three years to do so. We found that the only electrical connection with the vibrator was a small loose wire lying alongside of the magnet, and that in using the mallet a little oxidation would occur on the wire, which would break the connection. It would be sent to the factory to be brightened up, and the mallet would then work again. If any one present has a mallet that was bought previous to 1890, he will find this loose wire lying just alongside of the magnet as I have described it. We gave this information, in 1890, to The S. S. White Dental Manufacturing Company, and in appreciation of it they gave us a complete electrical outfit. I speak of this to-night so as to have it put on record, that we may receive credit for our improvement. Many dentists who have used the mallet discarded it when it did not work to their satisfaction. If this little alteration is made, it makes the mallet perfect. We did not patent our improvement, but gave it to the profession.

Dr. JAMES G. PALMER, chairman of the Clinic Committee, furnished a report of the all-day clinic held at the New York College of Dentistry March 12, 1895.*

The essayist, Dr. E. C. KIRK, of Philadelphia, was unable to be present on account of illness. His paper, entitled "Two Cases of Infantile Scorbutus," was then read by the secretary, and elicited the following discussion:

The PRESIDENT. The subject before us is on the border line between medical and dental science. Personally, I believe that they should be recognized as one science, that is, the science of medicine. I have invited several medical gentlemen to assist us in the more perfect discussion of the subject, knowing that they have had the opportunity of seeing more of these cases than we have been called upon to diagnose. I have the pleasure of introducing Professor William P. Northrup, of New York city, adjunct professor of diseases of children in Bellevue Hospital Medical College, also on the consulting and visiting staff of several other institutions in this city.

Professor NORTHRUP. I am exceedingly interested in the paper. It is very well presented, and gives a very clear picture of what we recognize as scurvy in children. I spent a little time with the author of the paper referred to in the paper just presented, known as the Bradshaw Lecture, in London, while he was preparing this paper. We talked over all the main points together, so when your president asked me to discuss the subject of scurvy, I thought I could not give you anything better than what may be called a composite picture of what appears to be scurvy. It is apparently a dietetic disease. It occurs as a malnutrition. The lesion is hemorrhagic. The hemorrhage occurs deep under the periosteum, preferably of the femora, and of the leg next, giving a fusiform swelling to one or both thighs; next in importance is an intra-muscular hemorrhage giving rise to painful nodules; hemorrhage beneath the skin giving rise to the well-known "black eye" and "black and blue" spots; hemorrhages underneath the skin causing pin-points, petechiæ, and "flea-bites;" hemorrhages in the mucous membrane which show themselves in the vomited matter and in the discharges from stool. All of the elements of the blood pass through the walls of the vessels in some way, without any demonstrable lesion. The walls apparently are intact. If any of you have seen a case of osteomyelitis of the septic variety, coming on after miscarriages or abortions,—such cases as we see in the hospitals coming in in ambulances,—will know that there is no sensation of pain more exquisite than the lifting of the periosteum from œdema. You cannot jar the bed, you can hardly drop a feather on the bed-clothing without causing the patient suffering. So you will get some idea of the exquisite sensation of pain in the legs of a child in the very first stages of scorbutus. Being usually in the lower limbs, the first symptoms are those of rheumatism of the legs. It has happened to many of my confrères to be called to a case of rheumatism of the legs in a child, and on looking at the gums, find a verification of the presumable diagnosis. The ages in which scurvy occurs mostly in the series of cases collected by Dr. Crandall and myself, were found to be nine to fourteen months. Thomas Barlow puts it at from nine to eighteen months. Our cases show preserved foods, proprietary foods, notably those most sold, of whatever kind they may be,—non-vitalized foods, foods that are not fresh, and in addition to that, condensed milk. Dr. Thomas Barlow's lecture and all other literature on the subject show the same. Even a little fresh milk will not prevent the development of scorbutus. Those cases that were reported are, I believe, all in children of well-to-do parents. Such is the discipline of the household trained nurse, that they cannot get away from this one measured-out meal, which is unwisely chosen. Most of the cases in New York have been brought in from the country by people who could afford to neglect all the rich resources of good milk about them, and send to the city and import a made-up food which had all the advantages of an illuminated wrapper and cover to show that it was an improvement on Nature.

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*This report will appear in our next issue.—ED. DENTAL COSMOS.

The first symptom, as I said, is pain and swelling about the femora. In the early part of the diapedesis, there is this exquisite tenderness that I mentioned. As this goes on, the child puts itself in an attitude to relieve all possible pressure from the muscles upon this fusiform swelling on the bones of the thigh. The child draws up the leg in bed. I have seen the same thing in cases of osteomyelitis in adults, where the leg is maintained on a pillow. Later, as the swelling goes on, the epiphysis of the lower end of the femora separates, so when the cases are examined after death, there are no evidences of any particular softening, but just a macerated bone, like a chicken's leg that has been boiled. When it has gotten to that condition, the leg lies perfectly flat, as though it were made of so many disabled joints. That is the attitude of inability,—so called pseudo paralysis. We do not like to speak of a *treatment.* We do not call it treatment. We simply change the regimen. We say give the child good air and good milk and fruit juice of any kind. Any one of these foods will allow it to get well promptly. The first case I ever saw happened to be the first one that was recorded in the literature of this country. I made the autopsy, not knowing what it was. The child had the black eye, and a peculiar sallow complexion, which gave it a very ghastly look. It had such spongy gums that, in the rigor of death, they stood out from the lips like buttons. There was separation of the epiphysis of the legs. The child died because the case was not properly treated, which means because the disease was unrecognized. I presented the matter to the Pathological Society, probably in this very room, thinking it was hemorrhagic syphilitic periostitis; but I soon got on the right track through some of the gentlemen present. As cases of this kind usually come in twos, the second case happened to come right after the first. I was asked to see a child living in a beautiful house; the child had had rheumatism of the legs for two weeks; the moment it saw a stranger coming, fearing that it was going to be molested, it commenced to cry and tried to crawl over its nurse's shoulder and get away. It was pitiful to see. In crying, it separated its dark-red ulcerated gums, and of course, having seen case No. 1, this case was clear at a flash. The child had one leg which was entirely disabled, and the other was very tender; but in five days after removing it to the city, and putting it on fresh milk and orange-juice, the gums were markedly reduced; in ten days they were well, and in thirty days the child was walking around as though nothing had ever happened to it.

From those two cases I thought best to see if I could not collate some cases. I wrote to everybody I knew, who was interested in these cases, and we got eleven. Those eleven constitute the first cases of scurvy in children that have gone on record. Some one asked me the other day, "How do you recognize scurvy in children?" I said to him, "*If the nurse tells you the baby has rheumatism of the legs, and you find spongy gums,—that is scurvy.*"

The PRESIDENT. I have the pleasure of introducing to you Dr. Floyd M. Crandall, lecturer on diseases of children in the New York Polyclinic, also chairman of the pediatric section of the New York Academy of Medicine.

Dr. CRANDALL. I think the paper is a most admirable one, and we have been very fortunate in hearing from Dr. Northrup. He is recognized by the medical profession as the man who "discovered" scurvy in this country. A year ago I was able to find not less than one hundred and fourteen authentic cases in this country, and I think since then that number can be increased by twenty. In the last year I have seen three. As your president asked me to speak on the etiology of scurvy, I will confine myself chiefly to that.

As to surroundings, among thirty-nine cases which I have studied, twenty-eight were seen in private families, and only eleven in dispensaries and institutions. In over half of these the surroundings were excellent, being rich and luxurious in many of them. Eleven were children living in the country or smaller towns. From these facts, it has seemed evident that scurvy is not essentially a disease of large cities, and especially not of tenement-house regions, and that unhygienic surroundings in themselves do not form an important feature in its production. A child in a tenement-house region is set to the table early, and gets about all the adults get. He is subject to diarrhea, and marasmus, and rickets, but he is free from scurvy, for he gets some fresh food; while the well-to-do child is so well cared for, and his diet is so strictly regular, that if it lacks the fresh element he gets very little else, and is liable to have scurvy.

On reviewing very carefully the various predisposing and exciting causes, I have come very positively to the belief that there is one cause which so clearly overshadows all others in importance as to be practically *the* cause of scurvy; that cause is improper feeding. To be more explicit, I should say it is lack of fresh food; and to be still more explicit, that it is the prolonged and exclusive use of proprietary foods and condensed milk. This will cause scurvy in *any* child without regard to its surroundings, its constitution, or its previous condition of health. Of the cases to date upon which I have positive knowledge upon this subject, nearly sixty-seven per cent. have been fed upon a proprietary food, condensed milk, or evaporated cream, either alone or combined. A very weak cow's milk mixture does not in some cases seem to be sufficient to protect the child. Sterilized milk has been credited with the causation of scurvy. It seems probable that milk sterilized at a high temperature, and for a long time, has been a feature in its production. I cannot believe, however, from the facts I have been able to gather, that the ordinary sterilizing of milk for a reasonable length of time and at a low temperature has been a feature in its production, when the milk has been properly modified and administered in proper proportions. I am coming more strongly to the belief that with the increasing use of the proprietary foods we shall see an increasing amount of scurvy.

It would be an error to suppose that all cases of scurvy are as definite as those that have been reported here to-night, although they are typical of the disease when it is well developed. I am coming to believe that there are many conditions which are truly scorbutic in character, which are *obscure* from the fact that they are *slight*, and are simply scurvy in its incipient stages. Children who are irritable and cry without appreciable cause, who seem to be sore upon being handled, or develop definite points of soreness on the extremities, *without* swollen, spongy gums, or hemorrhages under the skin, are sometimes greatly relieved by a change in diet. It is true that *rachitic* children are frequently sore and sensitive to touch, and are frequently irritable and fretful. Whatever the pathological condition may be in these sore, irritable, and worrisome babies, a change in diet often produces a marvelous improvement,—more so, it would seem, than could be accounted for by simple relief of the digestive disturbances. We shall fall into error to conclude that because a baby does not show *all* the more positive and typical signs of scurvy, a change of diet may not result in marked improvement in his condition.

As to the treatment, I would agree fully with what Dr. Northrup has said. Medicine is not only unnecessary but useless. Fresh cow's milk is sufficient to produce a cure in any of these cases. It can be aided materially by the use of beef-juice or orange-juice. Fresh milk, beef-juice, and orange-juice have come to be relied upon almost exclusively for these cases.

Professor NORTHRUP. We were talking at cross-purposes with Dr. Barlow about sterilized milk, until I learned that they had preserved milk in England. They seal it up in cans, send it to the market, and leave it there until it is sold. Here we sterilize it freshly every day. There they preserve it, and so it is like a proprietary food.

Dr. M. L. Rhein. The subject of the paper is one that has interested me very much for a few years past. The manner in which it has been treated by both Dr. Northrup and Dr. Crandall is of great benefit to all of us, and it should teach us to put our patients on their guard when we meet cases of this kind. The point that interests us from a strictly stomatological point of view has merely been hinted at by Dr. Kirk in his paper. This condition of affairs, when it presents itself to us for *what we should do*, is what I shall take under consideration. It shows itself to us as a form of infantile pyorrhea alveolaris. Just as we get pyorrhea alveolaris in any form of malnutrition in the adult, we find it in children afflicted with scurvy. It is due to a lack of nutritive matter reaching the gums and the periosteal tissues. We get a retrograde action, and as a consequence, the pyorrheal symptoms with which we are all acquainted. Where the case progresses beyond a reasonable length of time, the rapid disintegration embraces not only the pericemental tissue, the margin of the gum, and the alveolar sockets, pyorrheal results well marked in adults; but the tooth-structure itself rapidly becomes involved, and disintegration of the teeth themselves takes place in a most alarming manner. Dr. Kirk has so well illustrated that, in describing one of his cases, where nothing but the matrix of an incisor stands forth from the gum, that we can almost see the case itself. I agree very heartily with the last speaker in his statement that we more frequently meet these cases in a less serious form than has been mentioned, but we are bound to get the results in imperfect conditions of the gums. While the results depicted by Dr. Kirk do not often occur, yet when they do they require serious dental treatment, because the question must stare the medical practitioner in the face, "How will this child be fed?" The child reaches the age of two years, where he must masticate his food if he is to receive the proper nutrition to develop his body. If the case has been a serious one, like the one illustrated by Dr. Kirk, some serious dental work is necessary in order to enable that child to do any reasonable amount of mastication. In November, 1889, it was my good fortune to have brought to me a case of unquestioned infantile scurvy, and as it bears so strongly on the discussion which has taken place, I do not think I can do better than give a short description of the treatment which it was necessary to pursue, in order to enable that child to use its jaws properly thereafter. The case was sent to me after the condition of scurvy was practically cured. The child was then seventeen months of age. The mother, who had married a physician in New York, had been an old patient of Dr. McManus, of Hartford, and on his advice she consulted me about the child's mouth. The conditions of pyorrhea were well marked, even though the disease had been cured.

The cause of the disease in this case had been the use of a preparation of Swiss evaporated cream, or Swiss condensed milk. I must disagree with the two medical men who have preceded me, when they say that the change of the regimen will of itself bring about a condition of entire restoration of health; for we will find, in treating this form of pyorrhea, that while the change may produce a considerable restoration to health, the local symptoms, if not treated locally, will remain, because of the peculiar situation that they are in; that is to say, they are in the mouth, filled with bacteria, where, unless local antiseptic treatment is proceeded with, the simple constitutional treatment will be unable to bring about a complete restoration to oral health. Although the child was already very much improved in its general status, the gums were still in a puffed-out condition. Of all the teeth that were in that child's mouth (all of the temporary having been then erupted), the only ones that were left in the superior jaw that could be called teeth were the second molars. All the rest of the teeth had entirely disappeared, except little matrices, you might call them, of the tooth-substance, that projected from the gum in the manner that Dr. Kirk mentioned. In the inferior jaw disintegration of the tooth-substance had proceeded, but not to as great an extent as in the superior jaw. We soon corrected the condition of the gums, which was a matter of simple treatment. The father's main worry was as to how he could get the child's teeth put in such a condition that he would be able to properly masticate his food. It was evident that the child had suffered very much, but at the time I was not familiar with the distinctive pathology of the case. The necessity of giving him something to masticate with was very evident. As dentists, we must recognize the value of this point, not only that we want the child to masticate his food, and not depend on milk and artificial diet at an age when mastication should be proceeded with ; but we cannot fail to recognize the danger of a possibility of a lack in the development of the jaw with all its attendant evils, if at that age all the temporary teeth were removed. It was necessary for me to put that child of seventeen months under a chloroform narcosis on three different occasions (and they were long sittings of at least an hour each), in order to fill those roots and extend them with amalgam in such a way that the child could get a masticatory surface that he could use. That was in 1889. I have watched the case with much interest. I have seen the child at intervals of about twice a year, and he has grown to be a fine, healthy boy. He has now the permanent central incisors. In some of the teeth we had abscesses, but I did not extract any of the roots until it was time for the permanent teeth to appear. I am certain that the present good condition of the maxilla is due to the preservation of those temporary teeth at that time. This is the point that I wish to call attention to,—to urge upon you the importance of using every means to save such teeth until near a time when the permanent teeth will take their place.*

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[* Since the foregoing report was made by Dr. Rhein, the following additional data bearing upon the case in question have been communicated by him in a letter dated April 14, 1895.—Editor DENTAL COSMOS.]

"I had not seen the boy since last autumn. He was brought to my office yesterday by his mother, and in a lengthy conversation with her I discovered certain facts that are interesting, and which do not appear in my discussion. Up to eight months he was nourished at the breast and partly upon other milk. From then until he was brought to me he was fed almost entirely upon Swiss evaporated cream. There never had been a diagnosis of scurvy made, though when he was brought to me he was so restless that the mother states he never slept longer than intervals of fifteen minutes. All of which (I think erroneously) they attributed to the condition of his mouth. The chief point of interest which I desire to add to what I said, and the mother reminded me of it, was that ignorantly of the real danger of the diet of Swiss cream, I ordered a discontinuance of it, fearing that the mouth condition was caused by localized fermentation of the cream, especially at night, when they were in the habit of giving it to him every half-hour or so.

Dr. S. G. PERRY. I am not at home on this subject. I suppose that we came into existence as a profession through the influences of civilization, and if any attempt were made to account for our existence in a single terse phrase, I suppose it would be proper to say "civilization." If any attempt were made to account for the deterioration of the teeth as we find them at the present day, and we want to use a short phrase, we would probably say "civilization." I suppose it is perfectly proper to say that the prepared proprietary foods are a refinement of civilization. I have held for a long time that they are accountable for many of the diseased conditions of the teeth that we see so often, but I was not prepared before to believe that they could be made accountable for the conditions that have been described here to-night. However, I can readily believe that all that has been said is true, and I am more than glad that any such unnatural, artificial methods of feeding either the young or the old should be condemned.

Dr. LOUIS C. LE ROY. I had contemplated putting a few questions to Dr. Kirk upon this subject. I have looked into the matter somewhat since the publication of the title of the paper, and several questions have occurred to me :

Is scorbutus a general disturbance, or does it locate in any given organ or organs?

Is the affection of the gums constant? By that I mean, does it always occur with the appearance of the disease?

Is it a process of degeneration purely, or extravasation, or both? Gums may at first congest, which would mean extravasation, then stagnation occur, which could or would be followed by degeneration.

In going over the subject, I have found that salivation is sometimes confounded with scurvy, or likened unto it. Does salivation or ptyalism resemble scorbutus sufficiently to be the cause of false diagnosis, especially when an excessive flow of saliva is not present, which would, of course, give rise to the diagnosis of salivation?

In the absence of Dr. Kirk, I would request the medical gentlemen who are present to make us clear on these points, if they possibly can, so that we may be able to give as correct a diagnosis as possible when the cases are presented to us.

Professor NORTHRUP. The first question I cannot answer exactly. It seems to be a vascular disturbance without any lesion. There may be a fault of the blood or of vessels, or both. The blood goes through the cement-substance and leaves no trace. Ptyalism in scurvy is nearly always present in older children. No one of us sees enough of these cases to have a very dogmatic opinion, but as far as we can gather, it seems to be rather a constant feature, especially among the older children, that ptyalism does occur with this lesion of the gums.

There is another point just there that I would like to speak of. The spongy gums are said not to occur in children who have not yet cut their teeth. I do not know about that personally, but I think Dr. Barlow corroborated that statement. I have been very much

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"They thereupon discontinued the use of the proprietary food, put him on a mixed diet; the boy improved, and is in good condition now. The permanent central incisors are in position and normal. It was very interesting to notice that unwittingly I cured the boy, and have thus acquired the lasting gratitude of the mother.—M. L. RHEIN."

interested in trying to find what was this lesion of the gums. As near as I can find out, it is merely a hemorrhagic gingivitis, an excessive vascularity of the vessels, with a tendency to interstitial hemorrhage. The lesion is primarily a dilatation of the fine vessels. There is an excessive natural vascularity of not only the gums, but the lips and all that vicinity, so when it becomes inflamed there is a tendency to hemorrhage as well. At my last service in the Presbyterian Hospital, every little while a patient would come in with a queer look of the gums. Sometimes it was quite obvious that they had been taking mercurials. One woman confessed to having taken one-third of a grain of mercury four times a day for a week, and her gums were in an extraordinary condition. Of course, we do not know what takes place in these people afterward. We let them outlive their mercury and purge them, and get them on their feet again, and send them home. Does anybody know what becomes of those teeth? They seem to wabble in and out, and back and forth, but I do not see how they stay in. I wish I knew what this pyorrhea alveolaris is. I cannot understand from my standpoint why a temporary disease or temporary condition of malnutrition of the first teeth should have a permanent effect on the second growth. These teeth do not seem to have anything the matter with them: so far as I could see, they seem to have enough gum; some of them seem to have too much gum.

Dr. RHEIN. In discussing that part of the subject, unfortunately I lost sight of the fact that the two eminent medical men who were with us this evening were unfamiliar with the investigations that we have made in this special line of scientific research. It was my good fortune, last Thursday evening, at the regular meeting of the New York Academy of Medicine, to go into a detailed account of the very questions that Dr. Northrup has just propounded to me, as to the relationship that the gums bore and the condition we find them in in malnutrition, which is the point at issue here. This whole question is one of malnutrition. In my remarks, I made the assertion that the same principles which were true of malnutrition in the adult were true in the child. To try and make clear to Dr. Northrup what pyorrhea alveolaris is, I would say that the dentists of this country are somewhat divided on the way in which they look at this question. I am merely answering him from my individual standpoint, and that is, that the portions around the roots of the teeth and the gums are the most remote portions that receive the circulation of blood, and if there is an insufficiency of nutrition, the most remote portion of the circulatory system is the one to suffer most markedly. At that point we get a stagnation of the blood, due to insufficiency of the proper elements in the blood-corpuscles. Dr. Kirk mentions the fact that they suppose it is an insufficiency of red corpuscles. Whether the lack of fibrin has not something to do with it, is a question in my mind. I do not intend to follow up that point, however, but merely to tell Dr. Northrup that having a lessened amount of protoplasmic substance there, there is bound to follow in the peridental sockets of the teeth a retrograde action; that is, receiving inadequate nutrition, they are bound to go backward, and this is followed by a resorption of more or less of the tissues. As a result of that, we get what we call the pyorrheal pockets around the roots of the teeth, through which you can press the septic material that this degeneration of tissue produces, and it is this septic matter that adds a very important phase to the question of the getting well or not of the patient,—the amount of septic matter that is present,—because in that condition we are confronted by two possibilities, the absorption of pus, and the irritation to the alimentary canal caused by the swallowing of this septic matter that is bound to ooze from the pockets. What I want to make clear is, that after the patient has been turned loose from Dr. Northrup, and he has these wabbly teeth in the adult or in the child, we have these minute pockets. Perhaps in the child they are so minute that they are not detected ; but they are there, pockets where you can easily introduce a blunt-pointed instrument and find it covered with pus on removal. This means the constant increase of the pus-germs in those pockets, and the continuous destruction of the surrounding tissue until those pockets are thoroughly cleaned out, until the tissue lining the roots of the tooth is thoroughly freshened and removed, and the pockets so stimulated that there will result a fresh deposit of new tissue with proper healthy conditions existing, and the patient keeping up such an antiseptic spraying of the pockets that it is impossible for the germs to re-enter into these diseased pockets around the roots of the teeth. In fact, the greatest obstacle to the cure of all forms of pyorrhea consists in the difficulty that the patient experiences in keeping those pyorrheal pockets aseptic. If that could be easily done, the question of the saving of the many thousands of teeth that are lost through this disease would be easily solved ; but the mouth being such a difficult place to keep aseptic, it renders the question very difficult, and it can only be accomplished by the constant and persistent spraying of these pockets with a reliable germicide. We all know how much the different hydrogen peroxid preparations, especially the admirable preparation of McKesson & Robbins, the medicinal preparation of pyrozone, have been used for the local treatment of this condition by the patients themselves, and how much good they have done. Without the patient using such a germicidal spray our work would be utterly futile, and we are more or less unsuccessful in curing the local pathological condition in proportion to the disregard which the patient pays to our directions for thorough and frequent spraying.

A vote of thanks was tendered to the Faculty of the New York College of Dentistry, for courtesies in delivering short lectures or talks ; also to the clinicians, and Drs. Chicherio, Heath, and Katzmeier, for valuable assistance in procuring patients ; also to the subclinic committee for similar service.

The society tendered a vote of thanks to Drs. Northrup and Crandall for the very instructive discussion of Dr. Kirk's paper ; also a vote of thanks to Dr. Kirk for his paper.

Adjourned.

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At the annual meeting held Tuesday evening, April 9, 1895, the following officers were elected for the ensuing year :

John I. Hart, president ; A. R. Starr, vice-president ; Benj. C. Nash, secretary ; John H. Meyer, treasurer ; J. Bond Littig, librarian.

Delegates to the Dental Society for four years, Drs. James G. Palmer and Louis C. LeRoy ; for three years, Dr. F. Milton Smith.

B. C. Nash, *Secretary.*

## ACADEMY OF STOMATOLOGY.

MEETING of April 23, 1895.

*Discussion of Dr. Essig's paper.**

Dr. H. E. ROBERTS. I think I can see one way by which there may arise a very great difference of opinion regarding the number of cavities to be found in a mouth. I went into an office some time ago, and the dentist had a patient of mine in the chair. He said, "I have examined the patient's mouth and put in four gold fillings, and there are about two more, and her mouth will be in perfect order." I looked at the instrument he was using, and found it was quite a large excavator. I took a probe and found twelve cavities, which I showed him and showed her in the glass; well-marked cavities in the crowns of the teeth and the approximal surfaces. There I think is a case where there is room for a difference of opinion.

Dr. GROSSER. I think in Dr. Roberts's case there was no difference of opinion; it was a matter of lack of ability to diagnose. I suppose all of you who are acquainted with the kind of enamel where the nutrition has not allowed the enamel to unite in the fissures know that in many cases a man without a sharp eye would certainly diagnose absence of decay there, in which case it would be a mere lack of ability.

Dr. J. C. CURRY. I think often we are puzzled to know just what the code of ethics would require of a man when a patient from another operator presents himself for examination, and we can't help but discover cavities in the mouth. I recently had a case come to me where I not only found simple cavities, but I found some in which the pulp was very nearly exposed. She assured me, in the last few days, not over five days, she had been to her dentist, and he had been unable to find any cavities. Now, just what is expected of a man in that position I don't know. Surely your profession requires of you that you tell the truth, and your patient wants to know what is the matter with the other man's eyes.

I must confess that I have enjoyed Dr. Essig's paper; while there are some differences which might be reconciled to judgment and some to ability to diagnose, yet undoubtedly there are some cases which require criticism. Does the doctor think those cases should be treated that way, or should we pass them by and let our charity cover a multitude of the unsightly things that come to us?

Dr. ESSIG. It seems to be a case so very clear that a few words will answer it. It is clearly the duty of any dentist in whose hands a patient comes to find cavities if they are there, but as to criticising the other dentist to the patient, I don't think there is anything to be said on that score at all; it shows a low standard of ethics, and a man who is a gentleman would not do it.

Dr. ROBERTS. Is not the fact of finding cavities a criticism of the other dentist? What are you to do, refer the patient back to the former dentist?

Dr. MCQUILLEN. We are all likely to make mistakes, and a dentist will sometimes find that upon a patient returning he had missed something. We should be honest enough to say so in such a case. My father had a maxim of which I have often thought, and that was, if he hadn't a good thing to say about a man, he didn't say anything at all. I think that is as good a feature for a code of ethics as a man can work under in our profession.

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* "The Scientific Spirit and the Ethics of Dental Practice" See page 494 of the current number.

Dr. ROBERTS. I would like to ask Dr. Essig to answer a question on a matter which came to my office. A patient of mine brought her sister in, who had just been under the hands of another dentist, for me to examine her mouth; he had filled the two incisors, the upper one with gold, and in one of them there was a large space between the gold and the enamel of the tooth. I could pass the excavator directly in. Her sister was watching at the time, and said, "What is that?" I said, "I think the doctor has slipped up a little here, and I would advise her to go back and ask him if it was all right." Is that the right thing to do? Should I have criticised, and said he is a fraud?

Dr. ESSIG. I think the sending of a patient back to a previous dentist is right. That is exactly what I would do myself if it had recently been done; let the patient go back. After that, if the patient comes to you you are free. But to openly criticise to the patient the work of another dentist, is a thing that I cannot characterize in strong enough terms.

Dr. CHRISTENSEN. Dr. Essig said that no amount of education would make a gentleman out of a man who was not naturally one; it seems to me that is really so. Persons are taken into the colleges in this country without any large amount of previous training; that is the great difference between this country and the old country. I don't mean to hold the old country up as an example of something better; we do on the other side too much of the general training or education, and regard special education too little, but it seems to me that the general education should not be neglected; I think there ought to be a standard to be made before college is entered. I believe that would be a good thing; then they would take in men of better ability. The essayist spoke of those who are in the profession for mercenary reasons only; I believe if we had a higher standard of education before the person entered college, the profession would rise, certainly.

Dr. ESSIG. Dr. Christensen has misunderstood my statement. I stated in my paper that no written code would make a gentleman of a man who was not so by nature or by training.

Dr. DEANE. I was thinking of points which arise in practice which no code of ethics would exactly cover. There are many cases, especially in the treatment of children's teeth,—and I think the doctor will bear me out,—in which he would not operate just at that sitting, where he would consider it better to operate on a certain tooth six, three, or two months later; and when the patient gets away from his hands, through an aunt, sister, or mother, or some one else, into the hands of some one who is unscrupulous and will plunge an excavator into those teeth and say at once, "There is a cavity." That class of people ought to be ruled out of any society or any association with the better class of dentists. Instead of saying that the thing to do is to remain with the regular dentist, they are only too anxious to bore out the gutta-percha and insert gold.

I am perhaps a little bitter on points of that kind, because lately I have had a law-suit in a case in which I filled the front teeth with phosphate, two approximal cavities in the incisors, because I felt the tooth-substance was too weak to stand filling with gold. The young lady claimed on the witness stand that she went to Baltimore, and a dentist there had to refill them with gold, and they then had the gold fillings in. This was in court, and, fortunately for me, she claimed that all of my work had to be taken out and gold placed in the back teeth as well. The two experts I had called took the patient into a room and examined the mouth, and found that all the amalgam fillings were still in the back teeth, and she had no decay of the teeth whatever, but she did have gold in front. I still believe that she would have worn the phosphate equally as well as gold, if not better, for a few years. But it is such men that I think the code of ethics ought to get after in some way.

Dr. ROBERTS. I did not finish the description of the case I was speaking of. I said to the patient, "Will you take a note back to your doctor?" who happened to be a friend of mine, as well as her dentist. She said she would, but when she got out of the chair she said she believed she wouldn't go back there any more. She said she had been there a number of times for this same trouble, and he said there was no trouble there. She said she would write him a note, if I said so, and tell him she had left his office, and that she would seek services elsewhere. I would like to know just what is required of a man in a condition of that kind.

Dr. BURCHARD. Some nineteen hundred years ago there was a code of morals given to the world that will cover all points brought out this evening, or can possibly be brought up at any time; that is, what is ordinarily known as the Golden Rule. Rudyard Kipling, in one of his works, speaks of a certain ape, and says it has too much ego in its make-up, and that is a disease that afflicts not only apes, but a majority of mankind; and a lesson man needs to learn is that ego and alter-ego are not enemies, but brothers,—that what the world needs is the development of more of the altruistic spirit, and less egoistic spirit. By that I think all differences of this sort will be solved. What we need is more altruism and less egoism.

Dr. W. H. TRUEMAN. I am very much impressed with the paper. It is a very good one on a subject not very often discussed, but which I think might be discussed very profitably. It indicates a deplorable feature in the profession.

How shall we get at this matter and remedy it? That is the main point. Professor McQuillen struck the nail on the head many years ago when he said "a gentleman does not need a code of ethics, and a man who is not a gentleman will not heed it." If we are to find the remedy in the matter, it seems to me we ought to go to our dental societies, beginning at the one standing on top, for I think we find the code of ethics is there rather more rudely broken than in any cases Professor Essig has related to us.

On one occasion I was requested to prepare a paper, which I did at considerable expense and time, and sent it in and received a very complimentary letter. I did not attend the meeting, but the paper was read, and some one called out, "A bare-faced advertisement!" or that is about what it amounts to. Yet I was not there as a salesman, and had nothing to sell. I had no interest excepting that if I find a good thing I like my professional brethren to share it with me. I was not interested in it further than that. The next communication I had with the society was my resignation.

I think those things ought not to be, and that the code of ethics should be lived up to in a kindly spirit in our dental societies.

There is another point that I think is a violation of the code of ethics. We all have honest differences of opinion. You very often find a practical paper in which some new process is broached, and which begins by finding fault with every one else and every other method except that one. Sometimes very important improvements are thus made. I remember one instance at Asbury Park where a paper was read. Remarks were made which were very uncalled for and were a very gross violation of the code of ethics. All professional men who are original thinkers will at times feel differently and think differently, and we should respect each other's opinions. If a new thing is broached, we don't always take hold of it at once. We want time to think about it, but it should not be considered that we condemn it. It appears to me that when we get to that point in our dental societies where we can discuss differences of opinion kindly, we shall have gone a long way in correcting these matters to which Professor Essig has referred.

Dr. JAMES TRUMAN. I think there is altogether too much, not only of what Dr. William Trueman has stated in our societies, but in individuals, too much of this criticism one of the other. I have no sympathy with it. I think probably, as has been said before, that gentlemen will never do that kind of thing, and I don't believe that education will help very much.

I happened to be present when the paper to which Dr. Trueman has alluded was read. It was the American Dental Association. He didn't give the name, but I give it. I was shocked that any one should be treated that way in an association of that capacity. It was simply, I suppose, that somebody was tired, worn out, by sitting a long time. A long paper was read, and they made that remark. It was unpleasant and uncalled for.

But it seems to me there is a deeper thought in this matter, and that is that men differ and may differ honestly in regard to practice, and have a patient come to them, and they may say, for instance, there is not a cavity in that mouth that needs filling, and go to another man, and he may pick out twenty or thirty in the same mouth. Why? Simply because it is a lack of cultivation in the profession. Let me illustrate this, my one point. Take a man with very dense teeth, over forty years of age. Now, suppose that man gets into the hands of a person who has probably just graduated. I don't care where he comes from, what school. I have no reflection on any school; even might come from the one I am connected with. He will take that man, and he notes the black lines running over the teeth in the fissures of the teeth, and he will say, "Why, you have fifteen or twenty fillings needed on the masticating surfaces of the teeth," while an experienced person who has been in practice many years will say to that individual, "You have no cavities that need filling," simply because he knows that there is arrest of decay there and that there will never be any necessity for filling the cavities, and it would be simply a waste of time and strength of a man, and money; consequently we have differences of opinion that may be honest. A young man, inexperienced, finds a cavity that he can place the excavator in, and he naturally feels he ought to fill them, when it is not necessary to fill them at all.

Again, there is a difference with many of those who are advanced in the profession in regard to many points, that leads to reflection one upon the other. For instance, many men are like Dr. Perry, of New York, and like others and myself, that do not believe it is possible to fill children's teeth from twelve to twenty years of age with gold, who believe it wrong practice. Very recently, in a discussion of Dr. Perry's paper, I was taken to task very severely by my friend, Dr. Whitney, of Honolulu, in which he wrote me a very strong letter, stating that he was surprised that I would take such a position as that; that he had filled teeth for so many years, and trained under me, etc., and he was almost hurt that I should now advocate filling teeth at that period with gutta-percha. Here was an honest difference of opinion, and there must be some reason for it. I cannot conceive how two men, equally instructed, should make such a wide difference in conclusions. I don't know why it is, I don't know but I must attribute it to climatic conditions, that he can do in the Sandwich Islands that which is not possible for us to do here with children's teeth. So, therefore, the more we look at the matter outside of personal spite, so to speak, I feel that there is a wide margin for differences of opinion; and while it is not necessary that we should say anything at all derogatory to our brethren, still we must give an honest opinion to our patients when they come in from another party, and we all have it, every day. I don't know exactly how to meet it. A patient comes to me from another person, and I must give my opinion as honestly as I can; then they go back to that individual and say I said so and so; then that creates trouble. It is a thing that needs attention called to it more and more every year, and I am glad Dr. Essig has done so this evening, so that we can think about it and carry it to our homes with us.

Dr. Essig. If it is in order for me to rise again, I would like to speak on some points Dr. Truman brought out. Patients do quote us sometimes, and quote us without permission probably. I notice that of the new patients who come to my hands since I have been in practice, particularly in the last ten years, no name has ever been mentioned, and if the patients are cultivated people, belonging to the cultivated classes, they will not mention any names. In certainly nine-tenths of the patients that have come to my hands in ten years, no name has been mentioned at all, and there is no necessity for criticising other dentists, whoever they may be. But sometimes, as Dr. Truman says, patients will quote our remarks to other dentists, and that will make bad feeling. I want to mention, as bearing on this point, a case that occurred to me five or six years ago; a strange gentleman came to my office early in September, after the vacation was over. He explained to me that he was a lawyer, and had had a partial denture made, and it interfered with his speaking; that he spoke in court almost every day, and it was essential for him to have clear articulation. He took the piece out of his mouth and showed it to me and explained just how it behaved; that it was a little loose on the inner side, near the edge of the plate ; he said that he had trouble in forming words ending with S, and he had difficulty sometimes to make himself understood, particularly in speaking rapidly. He told me the name of the dentist who made it, and I told him at once to go back to his dentist and tell him just what he had told me, and I had no doubt he would make it right, and I refused to touch it. In two or three weeks he came back and said he had done as I told him, but that the dentist said nothing else could be done ; that he was not willing to do anything more, and that he had quit with him and the transaction was at an end. I did not like to take up the case at all, but the man was so persistent, and he gave me to understand he had settled his obligations with the other dentist, and the other dentist had dismissed him. The name he gave me was that of an acquaintance, and I thought I would communicate with him before doing anything for the man. In a few days I received a letter from the dentist, stating that the first piece of work had not been paid for at all, and that the patient was now trying to get an abatement or relief from all charges on the first piece, and among other things stated that the patient had said to him that I said the work was unscientific. Now, it is a word I never should have used in connection with a denture. He simply invented that ; however, in a few weeks he paid my bill, and then I instructed my secretary that whenever that man called, to refuse to give him an appointment. He did apply, and she told him he could not have an appointment for three months ; but he was very persistent, and asked if he could not come on Sundays or on a holiday, and finally I directed my secretary to write him that I begged to be excused from giving him any appointment at all. He never came to the office afterward. That was a case where a man had gratuitously quoted me falsely. I should never have said "unscientific." He put that in his own language.

Dr. HUEY. There is one phase that has not been spoken of. Most of us seem to think the Golden Rule requires us to do unto other dentists as we would have them do to us, but how about the patient? I think the patients have to be considered in this matter as well as the dentists. I especially think of a little experience of a patient who had been in my charge, fifteen or sixteen years of age, having pyorrhea, and when she came to me just after her marriage a few years later, she was in a most deplorable condition. I had her mouth in fairly good condition when she went to Europe two years ago ; she returned a few weeks since, and certainly three of the teeth will have to be lost. She left her children on the other side. She asked me the cause of the condition, and I told her it was because the tartar had not been removed from them. She asked if it was right to leave her children in charge of the dentist over there. You sometimes have to criticise even your professional brethren.

Dr. GUILFORD. Dr. Huey spoke of the duty we owe patients, and I think it is a very important matter. In most of what has been said it has been from the standpoint of the dentist ; that is all right, but we want to consider the patient also. I had a case come to me not long ago, of a lady who came from another city, having had work done by a dentist in another city whom I knew very well. She wanted me to look over the teeth and see if anything was needed, and I found at least half a dozen cavities, some of them half-way into the pulp, and that could have been filled easily a year before. I did not say anything about the dentist, but let her draw her own inferences. There is no use in trying to uphold another dentist when he has been careless or has done wrong.

Adjourned.

GEO. D. B. DARBY, *Secretary.*

## SECOND UNION MEETING OF THE WASHINGTON CITY DENTAL SOCIETY AND THE MARYLAND STATE DENTAL ASSOCIATION.

THE second annual meeting of the Washington City Dental Society and the Maryland State Dental Association was held at the Royal Arcanum Hall, Baltimore, Md., April 17 and 18, 1895.

### FIRST DAY—*Morning Session.*

Dr. CYRUS M. GINGRICH, of Baltimore, the chairman of the joint committee, opened the meeting at 10.30. Dr. C. C. HARRIS, of Baltimore, president of the Maryland State Association, made an address of welcome, which was responded to by Dr. J. ROLAND WALTON, president of the Washington Dental Society. Dr. Walton's address gave a short historical sketch of the birth, rise, and progress of dentistry as a profession, with its important special literature, the value of its association work, and the general enactment of laws to regulate its practice. He then introduced the subjects of the proposed memorial to Dr. Horace Wells and the needed unification of the laws, as follows:

"In another direction the associations are doing commendable work, having concluded to honor Dr. Horace Wells for his discovery of anesthesia by the erection of a bronze statue at the national capital. This is a fitting tribute to the discoverer. The site for the location of this memorial is the proper one. Being national in its purpose, it should without doubt be at the seat of the nation. But lingering over the well-intended motive is a brighter halo, which would encircle the brow of Dr. Wells more befittingly. I am sure if he were here he would accede to the effort to establish instead a national dental library and museum, which would prove a more enduring monument, and one which would elicit at least an equal degree of interest so far as the general public is concerned, and which would certainly redound to the greater welfare of the dental profession.

"A library and museum for the repository of dental literature, specimens, models, etc., embellished with a tablet, bust, or medallion to the memory of Dr. Wells, would be a more fitting tribute to him, the discoverer of the relief of human suffering.

"We have in the capital a National Medical Library in a most substantial building. Within this has been collected a vast amount of dental literature, which constitutes a special branch of the library and museum, and there is an annual appropriation of fifteen hundred dollars for this special collection. As shown by the following letter, all of this would be available for our purpose:

"DR. WILLIAMS DONNALLY, 1022 14th street, N. W., Washington, D. C.:

"*Dear Sir*,—Your letter of December 10 is received. The Army Medical Museum and Library are collections which attempt to cover the whole field of medicine, including dentistry.

"The library contains a large collection of books, journals, and pamphlets relating to dentistry, and an attempt is made to secure all the new publications of value in this branch in all languages. The museum contains between four hundred and five hundred specimens of casts of abnormalities and deformities of the jaws and teeth, but it should have at least ten times as many to properly illustrate this subject, and there should also be an extensive series illustrating the effects of various forms of treatment.

"The collections are contained in a fire-proof building, which is of ample size to permit of their expansion, and it is certain that everything contributed in the way of library or specimens will be properly preserved and exhibited, and duly credited to the donors. The collections are intended for public use and study, and are available for the researches of any one who chooses to come to the building for this purpose.

"I have attempted in past years to call the attention of the dental profession to this institution as one which they should endeavor to make complete in all matters relating to the pathology and treatment of diseases of the teeth and jaws, so that it might be considered by them as their national collection of literature, specimens, apparatus, etc., to illustrate the history and condition of dentistry, just as other sections of the museum and library are considered to be their national collections by the physicians, surgeons, and specialists of the country; and it appears to me that more definite, useful, and permanent results can thus be obtained than are likely to follow from an attempt to create a new museum and library devoted exclusively to matters of interest to the dental profession.

"Very respectfully,
"JOHN S. BILLINGS,
"*Dept. Surg. Genl. U. S. Army*,
"*Librarian S. G. O.*

"WASHINGTON, D. C., December 10, 1894."

"Consider for a moment how rapidly such a library and museum would grow. It has already the annual appropriation, besides the gifts of dentists in the way of books, periodicals, specimens, etc. Such a memorial as this can be made a very interesting place to visit and spend a few leisure hours. What a resort for the touring dentist, investigators, and students! Would not such a memorial as this place our profession on a higher plane and present to the world a vast collection of literature which otherwise could not be so fully appreciated? nor could the great public be made so well acquainted with the riches of our science.

"The bronze figure is left alone; there it stands on its pedestal, cold and uninstructive. What a marked contrast to a well-kept and growing library and museum! This would be a memorial calculated to instruct thousands from its volumes and numerous collections. Every dentist would be only too willing to offer at this scientific shrine something as a token of respect and gratitude to the beneficence of his profession.

"Duty compels each of us to give this subject our most careful consideration. Let all of us work in the interest of this library and give to it our support, as this will be the most befitting memorial of all. This age is strictly utilitarian; it is an era of practical philanthropy. An empty honor is at once a detraction from the ideal to be honored. In establishing the proposed dental library and museum, we not only honor the illustrious dead in a practical nineteenth century way, but we conserve the highest interests of humanity, and keep alive for all time to come the record of his greatness, just as the city of Washington will ever remain a growing monument in honor of the father of his country for ages after the obelisk erected to his memory shall have crumbled away.

"In concluding, I wish to show the effective work done by the National Association of Dental Examiners. As a unification of a dental law is almost an impossibility, they have overcome this, and have reached far in the proper direction toward making the law mutual.

"The following resolution was under consideration by the National Association of Dental Examiners at Old Point Comfort in August, 1894:

> "'*Resolved*, That it is the sense of the National Association of Dental Examiners, that when a member of the dental profession presents a certificate of registration from a State Board of Dental Examiners, duly created by law, that the same should entitle the holder of such certificate to registration without an additional examination in any state of the Union having a law to regulate the practice of dentistry; provided such certificate was obtained on examination.'

"This law should be rigidly enforced. It tends to elevate the standard of dental education. If all boards of dental examiners were rigid the colleges would be more thorough in their teaching, for no college would like its graduates to fail before such boards.

"Graduates do not object to an examination by a board of intelligent professional men,—men who have discretion and are impartial. Any one would have a hesitancy in going before a board on which was a member stating that 'he knew who would pass before they were examined.'

"When such evils are rectified and boards are composed of just examiners, there will be no friction. Appointments as examiners should not be political in any sense, but purely professional, and merit alone should govern."

On motion of Dr. WILLIAMS DONNALLY, of Washington, a committee was appointed, consisting of Drs. Donnally, J. H. Davis, and F. F. Drew, to consider the president's address.

The report of the Committee on Publication, Voluntary Essays, and Dental Legislation being called for, the chairman offered as his report the program of the meeting, and papers to be read by Dr. R. C. Bradshaw and Dr. W. A. Mills, which were not on the program.

Dr. R. C. BRADSHAW read a paper entitled "Our Profession *vs.* The Laity," in which he takes the ground that one of the most important duties of the dentist is to impress upon the minds of the people the fact that it is not his chief business to extract natural teeth and insert artificial ones, but to promote the vitality, utility, and salvation of the natural teeth, and prevent the necessity of artificial substitutes. To this end he holds that it is necessary to teach the public the value of the natural organs and the necessity of care in keeping them in hygienic condition at all times, and early consultation with a capable dentist when threatened with decay. That dentists should ever inform and impress upon their patients that it is held to be malpractice to extract teeth unless there is no possibility of so treating them as to preserve their usefulness, and that there is no reason why teeth should be lost if proper care is given them.

## *Discussion.*

Dr. H. M. SCHOOLEY, of Washington, said since most of us have tried to get rid of extracting we may when asked to do so say we do not extract teeth and do not know much about it; we used to extract, but do not now. The patient will probably be surprised and ask, "Are you not a dentist?" This is the first idea in their minds, that a dentist is one who extracts teeth. They do not think there is anything more in dentistry than to extract and supply artificial teeth, and this is the case with those who are ordinarily intelligent people: they are intelligent about other things, but indifferent about their teeth.

Dr. H. B. NOBLE, of Washington, said not only our patients, but the people should be taught in every way in our power the value of the natural teeth, and the necessity of caring intelligently for them. It is the duty of the dentist to do what he can to spread this knowledge, and such a course will in the long run benefit both the public and the dental profession. In his experience there had been a change for the better in this direction, saving teeth and roots that would formerly have been extracted. No educated, capable dentist at the present time but has replaced good substantial molars on roots, which would have been quite useless except for the gold crown.

Dr. WILLIAMS DONNALLY said most dentists are troubled with extremes in both directions, patients who want teeth saved which they would be better without, and patients who want teeth extracted which should be saved. Some teeth are so diseased that they cannot be made either comfortable or serviceable, and again in some cases the course of treatment would be too great a nervous strain on the patient. In all such cases it is not better to send the patient to a professional extractor, but do the work yourself. If you send your patient to one who makes a specialty of extracting, the next time he has a toothache there is a possibility of his going past your door and having the aching tooth out without consulting you, whereby he loses a tooth which perhaps you could save, and you lose a patient.

Dr. L. ASHLEY FAUGHT said pamphlets or other literature should be published under the auspices of the American Dental Association, or the State Associations, for circulation among the people. A dentist could not issue such under his own name, as it would be in the nature of advertising, but if published by authority of a dental association it would accomplish much good. It would teach the people the necessity of intelligent care of their teeth.

Dr. W. A. MILLS said that the public regard dentists as having only educated fingers, but not as being an educated profession. He spoke of instances in his practice proving this. One question he proposed was, "In case a patient insisted upon having a tooth extracted which ought to be saved, would it be better to send him away by refusing absolutely and finally to extract against your best judgment, or to extract it under protest, and thus save your patient for the future care of his teeth?" Of course, where it would really be a case of malpractice he would refuse to extract, but in some cases it perhaps would be wiser to yield.

Dr. P. E. SASSER, of Waldorf, Md., asked, What should a dentist do when patients could not afford to pay for necessary operations? Should he extract the teeth, or was it his duty to maintain his professional standing by treating and filling them with no expectation of being paid for his time and material?

Dr. W. A. Mills thought that in such a case, if they did not present themselves too often, the dentist might treat the teeth and fill with amalgam, and hope for pay, or at least that it would help him in his practice by the fact of the teeth being preserved. He did not believe in sending away any patient who could not pay the highest price for the most expensive materials. He had known a dentist who made it his boast that he never used anything but gold, and those who could not afford that could go to some other dentist. This kind of practice did not always pay, as was proved by the fact that the gentleman of whom he spoke, when he died, was buried at the expense of his society.

Dr. A. W. Sweeney, of Washington, said, in regard to the question by Dr. Sasser, the answer would depend somewhat upon circumstances. A dentist practicing in a country town would have to use his own judgment as to what was best, but in the case of one living where there was a dental college, the college clinics offered an easy solution. He did not think it right to extract a tooth which could be saved, even if his refusal sent the patient to another dentist. He holds that it will ultimately be necessary to have laws to punish the quack who advertises cheap sets of teeth and prevails on the ignorant to part with the natural organs to make way for the cheap substitutes.

Dr. Bradshaw, closing the discussion, said he thought it the duty of the dentist to do all in his power to save the teeth of all patients; but if the patient insisted upon extraction, he would extract rather than send him away. In case a patient could not pay the regular fee for necessary work, make a reduction to meet the circumstances, always letting your ordinary fee be known, and having it distinctly understood that you were breaking your rule to meet the necessities of the case.

Dr. W. A. Mills, of New York, read the following paper:

## The Toxic Effect of Quinin on Gum-Tissue.

Attention having been recently called to the toxic effect of mercury on the teeth, in a paper by Dr. W. E. Royce, published in the *Dental Digest*, January, 1895, I wish to call the attention of the profession to a pathological condition of the gum-tissue, which, after several years of investigation and questioning of patients, I believe to be caused by the toxic effect of quinin.

The first condition to attract my notice was the peculiar anemic and frozen-like appearance of the gum, especially that portion filling the gingival spaces.

On close examination I found no attachment whatever of the gums to the teeth, from the cervix down to the alveolar ridge, although apparently there was no separation, owing to the gum-tissue hugging the teeth closely. After years of investigation and comparing notes, I found in the primary stages of the disease the teeth and gums presented to the casual observer no very unusual appearance, unless it be, as it is in nearly all cases, the cleanly and apparently healthy condition of the teeth and surrounding parts.

A very few carious teeth are found, and, if any, nearly always situated in the grinding-surfaces of the molars. As time goes on, a process of wasting and contraction of the tissues surrounding the teeth continues slowly, but surely, until it reaches the line of the alveolar border, when all signs of wasting cease, leaving the teeth clean and apparently elongated.

From the primary condition to the termination of the disease there is not to be found any wasting away of the alveolar process, nor loosening of the teeth ; no pus-formation, as we find in pyorrhea alveolaris, no congestion of the tissues, no calcareous deposit of any kind ; no sense of pain or tenderness, either in the teeth or gums, the patient being totally unconscious of any abnormal condition. There may be during the progress of the disease a process of fermentation, but of this I am not positive.

Having beyond any doubt noted a new dental lesion, not to my knowledge described in any dental literature, I began to seek the cause. The first thing developed was that all the well-defined cases were found in the mouths of patients of nervo-bilious temperament, ages ranging from eighteen to thirty years. Next, that all were chronic sufferers from neuralgia, colds, malaria, and general debility, and, as a consequence, were addicted to the use of quinin in nearly all cases, taking large doses without the advice of a physician or dentist.

After seeking information from those well qualified to give an opinion, I have found, of the many drugs used in the art of healing, there is no other so constantly and universally used by the masses or so generally prescribed by both the medical and dental practitioner as quinin, in doses from three to fifteen grains, and by the physician in some cases as high as twenty to thirty grains.

It has been claimed by physicians of one of the schools that quinin, given in any quantity and continued but a short while, will prove destructive to the lime-salts of the teeth and bones. These assertions I cannot vouch for or deny, as my investigation of the subject has been very limited and superficial ; but I am sure, if any one should make it a study, he will find both instructive and interesting food for thought, and perhaps may find the first cause of a few, at least, of many dental phenomena.

From all the information gained upon the subject, I am firmly of the opinion that quinin is the sole factor in the pathological condition described. A friend has suggested, "May not the cause have been produced by mercury?" I answered, no, for the following reasons. In the condition described there is no pus-formation, no offensive odor, no wasting of bone-material, nor loosening of the teeth, but all the teeth are well formed and free from Hutchinson notches.

As yet, I have never suggested any remedy, as the cases are rare, not having seen more than twelve in as many years, and I have not had opportunity to follow them with any experimental treatment.

### *Discussion.*

Dr. T. S. WATERS, of Baltimore, asked Dr. Mills to describe the physiological action of quinin which produced the effect described.

Dr. MILLS answered that quinin is used as a tonic, and in large doses as an antiperiodic, but he was not prepared to say in what manner it acted on the system so as to produce the effect on the gums which he had noted.

Dr. B. HOLLY SMITH, of Baltimore, thought too much credit could not be given for original investigation, and if there is an original man among us Dr. Mills is one ; but he considered that he was at fault in assuming that quinin was responsible for the condition described, without more evidence than was shown in the paper. If this thing was true, others must have noticed it and recognized the cause, and it would be well to correspond with other careful observers, and prove the truth or error of the position.

Dr. MILLS said this was just what he desired. He had asked several dentists, most of whom had noticed the condition, but did not ascribe it to the action of the drug, but rather to a general run-down state of the system. He asked those who were present to report to him the result of their own observations.

Dr. A. W. SWEENEY thought that quinin in small doses would act as a tonic and promote the growth of tissue rather than destroy it, but hoped that investigation would be continued till the truth or error of the theory of the paper was established.

Dr. J. J. WILLIAMS said that the condition of the gums described in the paper was found among those who used snuff by rubbing it on the teeth, but thought in these cases the cause was mechanical.

Dr. W. M. ASH, of Washington, thought if the condition described was due to the use of quinin, it would be much more general than it is. In many cases the drug is in frequent use for years, and no such result occurs. He inclined to think that there must have been some other cause in Dr. Mills's cases.

Dr. C. C. HARRIS said that the effect of quinin and of some other drugs was entirely different in some individuals from what it was in others. He told of a gentleman who could not take quinin in any size dose without the most alarming symptoms, a single grain having caused him to swell up and suffer the most terrible pain, followed by collapse so complete that death was expected. Not knowing what caused these symptoms, some time afterward he took another similar dose with the same effect. The quinin certainly was poison to him as it is to some other men, notwithstanding the fact that to thousands it is beneficial. So it may cause toxic symptoms in the gums in others.

Dr. W. G. A. BONWILL, of Philadelphia, had never noticed the effect of quinin upon the gums.

Dr. D. ELMER WIBER, of Washington, had noticed many different phenomena following the use of quinin ; in some cases the taking of a single dose was followed by a rash and nervous trouble, while in others pains and noises in the head and ears occurred.

Dr. B. HOLLY SMITH had had the trouble of which Dr. Wiber spoke, and could not take even one-quarter of a grain without suffering from a rash and extreme nervousness.

Dr. MILLS, closing the discussion, thanked those present for the attention and discussion they had given to his paper, and trusted they would observe carefully and report anything bearing on the subject.

In the absence of the author, Dr. W. W. DUNBRACCO, secretary of the Maryland State Dental Association, read a paper by Dr. B. F. ARRINGTON, of which the following is an abstract :

## PYORRHEA ALVEOLARIS.

In looking over a recent issue of the DENTAL COSMOS and reading a lengthy paper pertaining to treatment of pyorrhea alveolaris, written by a prominent member of the profession, giving his treatment in full, very elaborate, displaying unquestionable ability as a writer and extensive familiarity with remedies, but so seriously deficient in correct features of a right conception of the disease and conservative treatment for relief and cure, as I view the subject, I have decided to discuss the much-abused subject, and will instead of mentioning more than seventy-five remedies as in the paper above referred to, for treatment of the disease, name less than half a dozen (quite sufficient), including *forceps* and *scalers*, important factors in treating cases of long standing.

In looking over some dental journals one rainy afternoon not long since, I recorded in less than two hours' time more than a hundred remedies suggested and advocated by sundry writers and practitioners of dentistry in treatment of pyorrhea. I paused to reflect, and was amazed at so extravagant a mention of remedies, so dissimilar in properties, the like never known or heard of before, in the practice of dentistry or medicine. One of the papers in question, enumerating no less than seventy-five remedies, is ably and well written, and valuable in some respects, but is far short of the mark in a practical point of view in reference to treatment of pyorrhea. The various theories (as to cause of the disease) set forth and advocated by sundry parties are almost as numerous as remedies proposed in treatment, varying from slivers of tooth-picks implanted between teeth, to gouty diathesis, diabetes, systemic debility, displacement of uterus, etc. The causes enumerated, except systemic predisposition, are almost universally consequent upon the disease, and when not, certainly not the cause. Pyorrhea, like most other well-defined diseases, has one cause and one only, not many as some seem to think. It is such unreasonable guesswork and wild theorizing as this, heralded by prominent men in the profession, that leads astray, and causes so much controversy.

Some contend that pyorrhea is a constitutional disease, and requires for its cure constitutional treatment; others contend that it is only a local disease and requires only local treatment; and there are others, a small minority, I am glad to say, who contend that it is constitutional, and that there is no cure short of removal of the teeth,—weak theory and censurable practice. Some of the best men in the profession argue and insist that the disease commences at the apex of roots of teeth; while others, equally able and experienced in the practice of dentistry, contend that it commences at the gingival border or margin around the necks of the teeth. Why should there be such difference of opinion on the subject? After all that has been said and written concerning the disease, the profession stands as far apart and non-agreed as to cause and treatment, to-day, as it did ten years ago. There has been too much said about a little matter, and discussions and controversy continue, and no one knows or can predict when or where it will end.

Pyorrhea alveolaris, as we term it for want of a more appropriate name (gingivitis, preferably), is a diseased condition of the gums originating in, and always, in its incipiency, confined to the gingival border, never at the apex of roots of teeth, or anywhere on roots from apex to margin of alveolar process. The disease is local, well defined, and easy to diagnose. I reiterate without fear of successful contradiction, that it always, without exception, commences in the gingival border, therefore is misnamed when called *pyorrhea alveolaris*. The alveolar process is never involved until the disease, commencing at the border or margin of the gum, has considerably advanced. Pus does not originate in the alveolar process (no one can show it and prove it), nor is there any waste of the process only as the effect of pus generated in the soft tissues. In the early stage of the disease there are neither pus nor granular deposits. The first deposits are granular, and always confined to the necks of the teeth ; then follows pus-formation and discharge, which more frequently than otherwise continues until the teeth loosen and drop out, or the disease is treated and cured. I have never known teeth to loosen until after cessation of granular formations around the necks of the teeth, and the formation of solid cake deposits on the roots. Always the consequence of a disturbed, abnormal state of soft tissues.

A patient, female, age sixty-eight, from whose mouth were extracted several months ago the five teeth here exhibited, had been troubled with the disease more than thirty years. When I first saw her, twenty-seven years ago, and detected an unhealthy state of the gums, there were granular deposits, more or less, around the necks of all of her teeth. The deposits were never removed by means of instruments, but, as you see, passed away, possibly through use of the brush. She assured me when I extracted the teeth that no dentist had ever advised her to have the deposits removed since I advised her to do so in 1867 ; said she had used mouth-washes freely, recommended by dentists and physicians to cure the scurvy, as they termed it, and that possibly she had expended several hundred dollars for such remedies, and without any good result. My observation has confirmed the impression on my mind that the granular deposits formed around the necks of teeth will sooner or later waste away and the surface become smooth, as you see demonstrated on the specimens ; but the solid cake deposit, which is a second deposit later on in the disease (very much the character of deposits found on the apex of roots), and never till the granular formation ceases, but when formed is there to remain, never wastes or obliterates as the granular, but increases to the destruction of alveolar process and loss of teeth.

Sanguinary deposit at or near the apex of roots is more difficult to treat than the disease in question. In the case of sanguinary deposit (not the effect or result of pyorrhea) the pus is formed deep down in the socket and progresses for exit to the alveolar margin ; whereas in pyorrhea the pus-formation commences at the margin of the alveolus and by degrees invades the entire process, leading to loss of the same and loss of the teeth. Every case of gum-waste or recession of gum-tissue we meet with is not pyorrhea, far from it. In a genuine case of pyorrhea that has advanced beyond the incipient stage we find tumefaction of gum, discharge of blood or pus (often both) on application of pressure. In cases of recession of gum (not caused by pyorrhea) we find the reverse, almost universally. Instead of inflammation, tumefaction, and discharge of blood and pus from the gum, as in pyorrhea, the gum is often pale, contracted, and shriveled. I have seen many such cases with loss of alveolar process and recession of the gum quite to the apex of the palatal roots of the superior molars, with freedom from tenderness under pressure, and no blood or pus visible. In such cases the teeth never loosen as they do in pyorrhea, nor is there fetid breath. In well-developed cases of pyorrhea, far advanced, deposits are always to be found, and blood and pus freely flow. In gum-waste or recession of gum there is no deposit, or very little, ever to be found, nor is there discharge of blood or pus. Very unlike derangements of gum-tissues. Pyorrhea, if neglected, becomes offensive and loathsome. Gum-waste progresses slowly, without painful, disagreeable, or offensive features, and never to the extent of loss of teeth. In case of sanguinary formations located at or near the apex of roots, extraction is the only sure remedy, and should not be delayed. It is impossible to effect cessation of pus-discharge in pyorrhea so long as a minute particle of cake deposit remains on any portion of a root in contact with soft tissues, yet the formation is consequent upon diseased tissue. When the deposit has advanced to the extent seen on the specimens here shown, nothing short of extraction will give relief. I contend, and have for many years, that, when from the effect of the disease, there has been destruction of two-thirds or three-fourths of the alveolus, teeth should be extracted, for there is no line of treatment by which the alveolar process can be restored and teeth made firm in their sockets, nor can the gum ever be made to adhere again to the teeth ; but if there is sufficient alveolar support and all deposit is removed, the gum, after proper treatment, will assume healthy action and contract closely and firmly around the teeth, and, if persistently manipulated with a toothbrush of suitable size and shape and occasional finger-pressure, will continue normal and perform a healthy function through life, unless weakened and rendered abnormal by some other disease than pyorrhea.

Some dentists do not recognize or acknowledge difference between genuine pyorrhea deposits and ordinary calcareous deposits. The specimens submitted demonstrate the difference. Pyorrhea deposits never attach to enamel and crowns of teeth, but always to the cementum, while the ordinary salivary calculus adheres to enamel, and sometimes completely coats and covers crowns to the thickness of a sixteenth or eighth of an inch, and is easy of removal compared to pyorrhea deposits.

Pyorrhea, like any other disease, is amenable to treatment, and can be cured ; and, when cured, will remain so, if instructions as to care, cleanliness, free use of the brush, etc., are carefully observed. There is no justification for so much talk about the disease not being curable. Such ideas are extremely absurd, should and must be discarded, and all must treat for cure, and the results will prove convincing and satisfactory. What one man in the profession can do, others can, on the same line of procedure, if they will. I have not, nor do I presume to say, that the line of treatment I pursue, alone, will always cure the disease, but I do say emphatically it will cure nineteen times in twenty. I have experimented considerably with various remedies recommended, but have never obtained as good results as with the remedies and treatment I will name and recommend in the interest of humanity.

As there is such diversity of opinion as to possibility of cure of this much discussed and abused disease, it may to some seem presumptuous and egotistical in me to profess to be able to cure the disease with few remedies and but little trouble, and as effectively, in a large percentage of cases, as any disease known to man, but there is no presumption or egotism in the matter. I make this statement on the subject as to treatment and cure, to assist, if possible, in a plain, practical way, my professional brethren, and encourage them to regard the disease as curable, and to proceed on a conservative and effective line of treatment, trusting that favorable results may be the reward of their efforts, made in the right direction.

The first step in treatment is to test the strength of the teeth in their sockets, and if any are to be extracted (all should be that cannot be made comparatively firm in socket) extract before commencing to remove deposits. Thoroughness in the removal of deposits is all important in treatment, and to secure perfect success *smooth-edge scalers* must be used, such as I send for careful inspection, five of a set of ten I use, points varying in shape and size. Of the five, with those marked one, two, and three, I remove at least nineteen-twentieths of all deposits. You perceive the edges are smooth and can do no injury to surface of root, alveolar process, or soft tissues surrounding. To lacerate the gingival border (entire) and produce new action, if possible, is important for cure. The removal of deposits prevents continuation of the disease, but does not prevent return of it. Soft tissues below and away from gingival border should be preserved as free from injury as possible, also the alveolar process, which is never in fault and has no part in the disease but to suffer loss, and is often seriously affected as the effect of a cause always originating in the gum border, which increases by degrees and creates the cause of alveolar trouble. Remove the cause and the effect will abate, and the alveolus will speedily take on healthy action, always will if deposits are thoroughly removed and *sulfuric acid* is generously applied. The practice advocated by some to chisel, scrape, and bur away the alveolar process (any portion of it) is absurd. Sulfuric acid properly applied is better for weakened and softened alveolus than chisels, burs, and scrapers.

I have never chiseled and scraped the process in treatment of the disease more than two or three times, and then it was not imperative for cure. When you think the last vestige of deposit has been removed, probe carefully again and again to make sure of completeness. In some extreme cases it requires from two to three hours' persistent effort for removal of deposits. When this has been accomplished, then with brush of proper size (small) and shaped to suit, brush heroically with diluted C. P. sulfuric acid and pulverized pumice (not finest), varying according to age and extent of disease, from one of acid to ten, fifteen, or twenty of water. Make it a point, universally, to fret and lacerate the margin of gum with brush and pumice, with a view to new and healthy action. Do not fear injury to surface of teeth from effect of the acid. No injury ever does or can result. As evidence of the slight effect upon enamel or cementum, I send for inspection a tooth which was kept in a mixture of one of acid to ten of water for twenty-four hours.

Much good and no harm can come of the free use of sulfuric acid in treatment of the disease. It is seldom necessary to apply it more than one time for cure. After the use of brush, acid, and pumice, press the gums well with finger, then apply to the gums freely campho-phenique (full strength), and instruct the patient to use a brush, the same as was used in the treatment, forcibly and systematically, several times daily for a week or two, specially after meals and before retiring at night, and to follow the brushing with finger-pressure until the gums are healthy and firm. Advise the patient to return to the office the next day after treatment, or the day following, and for several days for careful inspection, probing and removal of any particles of deposit that may be detected, and to see if instructions as to brush and finger-pressure are respected.

Some patients will neglect to carry out instructions, if not watched and encouraged to persevere. It is important in treatment and really essential to use the brush forcibly, and fret the gingival border to bleeding if possible, for several days after removal of deposits. Applications of campho-phenique (full strength) to the gums two or three times daily for several days will prove beneficial. In the incipient stage of the disease, before granular deposits are formed around the necks of the teeth, the free use of acid and pumice with brush is all that is requisite to check and obliterate the disease. It is at that stage as truly pyorrhea as in more advanced stages, when there are deep pus-pockets, cake deposits on roots, and teeth loosened to loss. It commences as pyorrhea, progresses and ends as pyorrhea, is pyorrhea all the way through from commencement to cure or final loss of teeth. One line of treatment is requisite for cure,—*viz*, that above stated. If faithfully tried and persevered in, good results will always be realized. In cases as we meet with them, cure can be effected in from five to ten or fifteen days.

Such are my convictions, based upon experience and careful observation of results during many years' practice. I have made a specialty of the treatment of this disease for some years, and only state as to treatment and results what I know to be facts, facts that will be realized and appreciated as such by any unprejudiced, fair-minded practitioner of dentistry who will faithfully experiment for results on the line of treatment above indicated. The idea that *various causes* as above enumerated can and do produce the disease is erroneous, and is as ridiculously absurd as for physicians to say (some do) that this or that disease runs into typhoid fever, or that typhoid fever is the consequence of a broken or otherwise injured limb, or any other physical injury. Typhoid fever is a pointedly marked and distinct disease of well-defined features and characteristics, and never the result of other diseases or physical injury. So it is with pyorrhea. No man can produce it by any injury he may inflict upon gum-tissue or parts adjacent. It is spontaneous and truly an independent disease, having its well-defined marks and running its course if left alone. In its incipiency it is recognizable, and much more strongly marked and outlined than many other diseases, and if let alone will slowly advance to destruction of alveolus and loss of teeth. There is but one class of persons (the toothless) free from its ravages. It is of as frequent occurrence in early life, after the age of twelve or fourteen, as in later years; but the cake, or sanguinary deposit (as termed by some), is never so well developed, and teeth but rarely loosen from effect of the disease before the age of thirty or thirty-five.

As to cause we are yet ignorant, and may grope in darkness on the subject a great while before the shadows are dispelled and the true light of cause shines forth. Physiologists and pathologists must investigate and settle the question. I am inclined to the opinion that the *saliva* contains the cause of the trouble. It is more reasonable than any other theory I can venture. After treatment and cure, the daily use of a tooth-brush, corresponding to the sample exhibited, is requisite, and occasional finger-pressure will aid healthy preservation of the gums and serve as a safeguard against return of the disease. The size, shape, and quality of a brush for daily use is an important matter. To cleanse the teeth well and do no detriment to soft tissues, is to be considered in the selection and use of a brush. Large brushes with stiff bristles, closely set, are objectionable, and are always more hurtful than beneficial.

The fewer the remedies, the better, so a good result is obtained. The advocacy of and sanction of a hundred remedies or more, for treatment of a single disease, is contrary to all reason and radical in the extreme, and can but tend to bewilder the minds of young practitioners, and cause many to question and doubt their ability to treat the disease at all. So much speculative theorizing as to cause of the disease, and treatment, has doubtless done more harm than good, for there is no evidence of advance and a general line of treatment (truly defined) established.

I am recently very definitely convinced on one fact in relation to pyorrhea. It is not contagious or transmissible from one person to another. I have watched carefully for results for more than a quarter of a century, and am now thoroughly convinced that there is no such thing as transmitting from parent to child, or from one person to another, under any circumstances. I have known several families residing in the country, embracing each, parents and five or six children, where one or both parents were subject to the disease, and all would use one copartnership tooth-brush (a disgusting practice) until worn out, then another, and so on as needed, and not a child after a lapse of ten or fifteen years ever evinced the slightest feature of the disease. In one case in point, the husband, very loving and affectionate, fond of kissing wife and children, was subject of the disease for more than thirty years (a typical case), losing by waste of process tooth after tooth, until but few remained in his mouth, and never did wife nor any of the children show signs of the disease. He (the husband) enjoyed good health, and he assured me more than once he never suffered a moment from indigestion, and experienced no particular discomfort from the disease.

I will mention one more case which I watched carefully for results for eighteen years, anticipating evil results from a censurable practice, but was disappointed. Mrs. —— died, leaving a boy child about six or eight months old, who was taken charge of and cared for by its grandfather and an old aunt, both subjects of pyorrhea well advanced, many teeth very loose, gums inflamed and swollen, and blood and pus discharging freely under slightest pressure. The child was the pet of the family, and was tenderly cared for, first one, then the other, grandfather or aunt feeding it, and for months the process of feeding was as follows: One or the other would chew and pulp the food in their mouths, then put it in the mouth of the child; so the food was prepared and administered until the child was able to masticate for itself. I advised against such a course, and informed them of the chances and very great probability (as I then thought, do not now) of transmitting the disease to the child, but they heeded not. The child survived and grew up to manhood years and stature, a splendid specimen of physique, and blessed with as healthy gums and sound teeth as could be desired. Should the young man be troubled with pyorrhea (quite possible) after this, would any contend that the disease was transmitted through food pulped and administered by grandfather and aunt? I could cite other cases almost as extreme, and quite as convincing to unbiased minds that the disease is not transferable by any process of contact, or through any channel of conveyance of disease.

The disease has many peculiarities, and will ordinarily, if not treated, run its course, and in a large majority of cases will hold on during life, or until the teeth involved loosen and drop out. All persons troubled with the disease do not suffer alike. Some do not experience any discomfort or inconvenience from the disease, while others suffer greatly and fail in health. Dentists should not be overexercised concerning the cause of the disease. Physiologists and pathologists must and will settle that question, and possibly very soon, if they will look to the *saliva* during incipient stages of the disease, and work on that line for facts that will be convincing. The important consideration for practitioners of dentistry is to learn how to diagnose correctly and treat for cure. If we will concern ourselves less about cause and direct our efforts in preparation to treat successfully pyorrhea, or any other type of disease that may present for treatment, it would be wiser and more in line with our province of action, and doubtless best for our patients. All this theorizing and discussing as to cause, and advocacy of innumerable remedies for treatment, is of no special benefit to dentists or patients, but is often mystifying and hurtful. To investigate cause of disease is one science, and to treat for cure is another, quite apart, separate and distinct, and if we attempt to couple them we confuse and fail of best results. Cause known or not, let us treat to cure, and cure we can.

On motion, the discussion of Dr. Arrington's paper was postponed to the next session, and the convention adjourned.

(To be continued.)

## MARYLAND STATE DENTAL ASSOCIATION.

At the twelfth annual business meeting of the Maryland State Dental Association, held April 26, 1895, the following officers were elected to serve for 1895–96: W. W. Dunbracco, D.D.S., president; Bernard Meyer, first vice-president; M. G. Sykes, D.D.S., second vice-president; F. F. Drew, D.D.S., recording secretary; R. C. Bradshaw, D.D.S., corresponding secretary; J. G. Henisler, D.D.S., treasurer; T. S. Waters, D.D.S., Wm. A. Mills, D.D.S., B. Holly Smith, M.D., D.D.S., executive committee.

F. F. Drew, *Secretary*,
701 N. Howard street, Baltimore, Md.

## EIGHTH DISTRICT DENTAL SOCIETY OF THE STATE OF NEW YORK.

At the twenty-seventh annual meeting of the above society, held in Buffalo, April 30, 1895, the following officers were elected for the ensuing year: Dr. W. W. Coon, Alfred Centre, president; Dr. Richard Kessel, Buffalo, vice-president; Dr. W. E. Marshall, Buffalo, recording secretary; Dr. E. M. Baker, Medina, corresponding secretary; Dr. C. W. Stainton, Buffalo, treasurer; Dr. S. A. Freeman, Buffalo, librarian; Dr. H. H. Boswell, Buffalo, and Dr. H. J. Burkhart, Batavia, delegates to the state society.

Meetings will be held on the last Tuesday evening of each month, from September to April inclusive.

W. E. Marshall, *Secretary*,
336 Connecticut street, Buffalo, N. Y.

## HARRIS DENTAL ASSOCIATION.

At the twenty-eighth annual meeting of the Harris Dental Association, held at the office of the secretary in Lancaster, Pa., on May 2, 1895, the following-named were elected to serve as officers for the ensuing year: Dr. H. D. Knight, president; Dr. Wm. H. Lowell, vice-president; Dr. D. R. Hertz, treasurer; Dr. William N. Amer, secretary.

William N. Amer, *Secretary*.

## CHICAGO DENTAL SOCIETY.

At the annual meeting of the Chicago Dental Society the following were elected as officers for the ensuing year: W. V. B. Ames, president; C. E. Bentley, first vice-president; J. A. Dunn, second vice-president; A. H. Peck, secretary, 65 Randolph street; H. A. Costner, corresponding secretary; E. D. Swain, treasurer; H. A. Gunther, librarian; Geo. H. Cushing, J. N. Crouse, J. G. Reid, board of directors; D. C. Bacon, H. W. Sale, E. R. Carpenter, board of censors; G. B. Perry, chairman committee on exhibits.

H. A. Costner, *Cor. Sec.*

# DENTAL COLLEGE COMMENCEMENTS.

## CLEVELAND UNIVERSITY OF MEDICINE AND SURGERY—DENTAL DEPARTMENT.

The annual commencement exercises of the Dental Department of the Cleveland University of Medicine and Surgery were held (in connection with those of the medical department) at Association Hall, Cleveland, Ohio, on Tuesday evening, March 26, 1895.

The number of matriculates for the session in the dental department was twenty-seven.

The degree of D.D.S. was conferred on the following graduates:

Samuel Howard Stevens, Louis Amedius Keller, Jay Thorne Newton, Edwin Stanton Kiplinger, and James Milford Chambers, all of Ohio.

## Kansas City Dental College.

The thirteenth annual commencement exercises of the Kansas City Dental College were held at the Auditorium, Kansas City, Mo., on Friday evening, March 1, 1895.

The salutatory was delivered by William A. DeBerry, D.D.S.; the faculty address by Professor Rathbone; the valedictory by Amos L. Curry, D.D.S., and the annual address by Bishop Hendricks.

The number of matriculates for the session was one hundred and fifty-three.

The degree of D.D.S. was conferred on the following graduates by Dr. L. C. Wasson:

| NAME. | STATE. |
|---|---|
| George A. Adcock | Missouri. |
| George R. Burns | Indiana. |
| John Barber | Missouri. |
| Ferdinand J. K. Bush | California. |
| Walter E. Blackwell | Missouri. |
| William H Brosman | Nebraska. |
| Theron I. Branstetter | Missouri. |
| Julian C. Bogue | Oregon. |
| Harry W. Balthrope | Mississippi. |
| Edward L. Conrad | Missouri. |
| Amos L. Curry | California. |
| Henry W. Cussons | Nebraska. |
| John W. K. DeHaven | Missouri. |
| William A. DeBerry | Missouri. |
| Leland P. Davis | Nebraska. |
| William E. Furrow | Oklahoma. |
| Charles I. Glenn | Missouri. |
| Walter R. Gwin | California. |
| George J. Geenen | Illinois. |
| Joseph T. Longstreth | Missouri. |
| Joseph Lutz | Kansas. |
| Jesse Miller | Missouri. |
| Samuel M. McDonald | Missouri. |
| Milton B. Metzler | Missouri. |
| Franklin K. Munday | California. |
| James A. Nevitt | Missouri. |
| Thomas G. Newell | Minnesota. |
| Charles C. Needham | Missouri. |
| Charles M. Palmer | Colorado. |
| Abram P. Preston | California. |
| Harry L. Prevost | Missouri. |
| Frederick H. Riley | Missouri. |
| Overton M. Saul | California. |
| Charles N. Smith | Kansas. |
| Albert R. Streicher | Missouri. |
| Arch. Thompson | Missouri. |
| John W. Vaughn | Kansas. |
| Walter Z. Wright | Kansas. |
| Eric C. Watkins | Kansas. |

## Missouri Dental College.

The twenty-ninth annual commencement exercises of the Missouri Dental College (Dental Department of Washington University) were held on Thursday, March 28, 1895.

The valedictory was delivered by Dr. Frank A. Glasgow.

The number of matriculates for the session was eighty-six.

The degree of D.D.S. was conferred by Chancellor Winfield S. Chaplin on the following graduates:

| NAME. | STATE. |
|---|---|
| Samuel F. Arthur | Missouri. |
| Harry F. D'Oench | Missouri. |
| James A. Henderson | Missouri. |
| Isaac F. Hereford | Missouri. |
| James B. Houf | Missouri. |
| William J. Lark | Illinois. |
| Lorenz E. Lehmberg | Missouri. |
| James F. McLellan | Missouri. |
| John W. Marsh | Illinois. |
| George L. Miller | Missouri. |
| John B. Norris | Missouri. |
| Thomas Owings, Jr. | Missouri. |
| Nova G. Phillips | Missouri. |
| Rudolph L. Schmitt | Texas. |
| Clay V. Sidener | Missouri. |
| William F. A. Schultz | Kansas. |
| Benjamin F. Stevens | Missouri. |
| Charles I. Trimble | Missouri. |
| Alfred C. Washington | Illinois. |
| Frank C. Wick | Missouri. |
| Thomas W. Willard | Mexico. |
| Edward A. Woelk, Jr | Illinois. |
| Francis M. Worley | Kansas. |
| James McH. Young | Missouri. |

## BALTIMORE COLLEGE OF DENTAL SURGERY.

The fifty-fifth annual commencement exercises of the Baltimore College of Dental Surgery were held at Ford's Grand Opera-House, Baltimore, Md., on Thursday afternoon, March 21, 1895, at 2 o'clock.

The annual oration was delivered by Rev. William Rollins Webb, and the valedictory by B. M. Smith, D.D.S.

The number of matriculates for the session was one hundred and sixty-six.

The degree of D.D.S. was conferred on the following graduates by Professor M. W. Foster, dean:

| NAME. | STATE OR COUNTRY. | NAME. | STATE OR COUNTRY. |
|---|---|---|---|
| M. H. Adams | Louisiana. | C. Meikle | New York. |
| J. G. Armacost | Maryland. | O. Morgan | Pennsylvania. |
| H. G. Baxter | New York. | J. B. Rousseau | Alabama. |
| H. J. Boyd | New York. | L. D. Reavis | Oregon. |
| C. E. Brown | Virginia. | P. C. Richardson | Texas. |
| S. P. Cronan | Connecticut. | I. C. Rink | Pennsylvania. |
| W. G. Dalzell | Louisiana. | W. R. Roland | Pennsylvania. |
| G. R. Dashiell | Texas. | W. H. Simpson | Massachusetts. |
| A. E. DeViney | Texas. | G. F. Showers | West Virginia. |
| H. R. Eavey | Maryland. | B. M. Smith | Pennsylvania. |
| K. W. Egerton | Maryland. | E. M. Summerville | Pennsylvania. |
| F. W. Epes | Virginia. | E. H. Sting | Ohio. |
| C. H. Frink | Florida. | W. M. Sturgis | Virginia. |
| J. G. Geiger | South Carolina. | C. H. Theberath | New Jersey. |
| Fred. Hammond | Maryland. | A. C. Thweatt | Virginia. |
| D. S. Henry | South Carolina. | F. Waesche | Maryland. |
| M. J. Hellwig | New York. | J. L. Walker | Virginia. |
| H. Hoeper | Germany. | R. H. Weiskotten | New York. |
| H. W. Hoffer | Texas. | E. Weymouth | Maine. |
| E. G. Laflin | Connecticut. | G. W Williams | West Virginia. |
| T. H. Lowe | Massachusetts. | J. H. Wheeler | North Carolina. |
| J. W. Lyle | Mississippi. | H. White | Maryland. |
| A. M. Marcy | Ohio. | | |

## UNIVERSITY OF TENNESSEE—DENTAL DEPARTMENT.

The annual commencement exercises of the Dental Department of the University of Tennessee were held at Nashville, on Thursday, March 21, 1895.

The charge to the dental graduates was delivered by Professor Joseph P. Gray, M.D., D.D.S., and the valedictory by W. A. Titus, D.D.S.

The number of matriculates for the session was fifty-eight.

The degree of D.D.S. was conferred on the following graduates by Thomas W. Jordan, A.M., acting president of the university:

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| J. W. Blair | Tennessee. | J. R. Pendleton | Missouri. |
| S. A. Garth | Missouri. | J. I. Pettus | Arkansas. |
| F. M. Gayle | Louisiana. | J. T. Phillips | Alabama. |
| E. D. Hancock | Kentucky. | N. A. Royer | Tennessee. |
| Clarence Huston | Missouri. | H. R. Rouse | Indiana. |
| J. B. Love | Tennessee. | A. C. Seiser | Missouri. |
| J. E. McGowan | Tennessee. | W. A. Titus | Pennsylvania. |
| L. H. New | Tennessee. | | |

## NEW YORK COLLEGE OF DENTISTRY.

THE twenty-ninth annual commencement exercises of the New York College of Dentistry were held in Chickering Hall, New York city, on Monday evening, April 15, 1895.

The address to the graduates was delivered by Rev. Geo. R. Van deWater, D.D., and the valedictory by J. Levin Chaim, M.D.S., D.D.S.

The number of matriculates for the session was three hundred and sixty-one.

The degree of D.D.S. was conferred on the following graduates by Professor Frank Abbott, M.D., dean of the faculty :

Robert R. Abrams.
Ivring F. Adams.
William H. Achtel.
Joseph D. Alvord.
Ralph E. Aitken.
Otto H. Albanesius.
Eugene F. Beers.
Albert R. Benedict.
Arthur I. Bernstein.
Albert R. Brown.
Ernest T. Brown
Frederick C. Brush.
Joseph L. Chaim, M.D.S.
Myron L. Colburn.
John T. Conlon.
Ernest A. Wm. Dahlman, A.B.
Clinton A. Downs.
William B. Dunning.
Robert McK. Farris.
John T. Gilchrest.
Horace P. Gould.
Solomon R. Halley.
Harry E. Hawes.
Louis A. Held.
Michael P. Higgins.
Charles M. Hoblitzell.
James D. Hyland.
George A. James.
Albert M. Johnston.
Herman J. Kaufer.
John W. Kingsland.
Charles F. Kirkup.
Albert E. Koonz.
Clinton H. Leighton.
Wm. R. Longenecker.
William D. Lubitz.
John A. Marr.
William B. Martin.
Clarence M. Master.
Carl F. C. Mehlig.
Max J. G. A. Meibauer.
William H. Meyer, B.A.
Arthur H. Merritt.
Arthur P. Morgan.
John H. McArdle.
George A. McEachren.
Harrison A. McNear.
Kelsey B. Osmun.
George B. Palmer.
David A. Proctor.
William B. Ready.
John W. Remer.
George E. Reynolds.
Austin J. Ruddy, Jr.
Moritz M. Salomon, B.A.
Harry L Sanford.
Johann F. Schaeffer.
Granville E. Scofield.
Otto Schreiber.
Charles A. Secord.
John F. Shea.
Robert A. Sheppard, Jr.
William B. Short, Jr.
Morris Skalmer.
Edgar E. Sloss.
Walter D. Smith.
Oliver E. Stedman.
Howard M. Stowitts.
George T. Stevens.
Albert J. Todd.
Robert V. Totten.
Jason H. Tuttle, Jr.
Clarence W. Travis.
Herbert M Vanderbilt.
Theodore D. Van Sickel.
Jose V. Y. Vilaret.
E. Waller.
Frederick S. Welden.
Dwight O. Whedon.
Augustus H. Xiques.
Joaquin Yela, Jr.

## OHIO MEDICAL UNIVERSITY—DENTAL DEPARTMENT.

THE third annual commencement exercises of the Ohio Medical University, including the Dental Department, were held in the Board of Trade Auditorium, Columbus, Ohio, on Tuesday evening, March 19, 1895.

The annual address was delivered by S. McChesney, D.D., and the address on behalf of the faculty by G. M. Waters, B.A., M.D.

The number of dental matriculates for the session was fifty-four.

The degree of D.D.S. was conferred on the following graduates by J. M. Dunham, A.M., M.D., president of the board of trustees :

Enoch Francis Downing.
George Howard Henry.
Elmer Earnest Latham.
Arthur Nettleton Lindsey.
Dr. T. Gray Merrett.
Charles Stewart Millen.
George Prince Stephenson.
Halstead Robert Wright.

## CHICAGO COLLEGE OF DENTAL SURGERY.

THE thirteenth annual commencement exercises of the Chicago College of Dental Surgery were held in the Schiller Theater, Chicago, Ill., on Tuesday, April 2, 1895.

The number of matriculates for the session was four hundred and sixteen.

The degree of D.D.S. was conferred on the following graduates by Truman W. Brophy, M.D., D.D.S., dean of the faculty :

Cassius L. Anderson.
Robert E. Anderson.
Rene Anema.
Arthur Atkinson.
George F. Baker.
Peter T. Barber.
Uri N. Barber.
William O. Barrett.
Preston G. Beirman.
Joseph Bendit.
Howell Boatner.
Ivory L. Bowman.
Louis B. Bradley.
John F Brenneman.
Edward F. Brown.
James J. Carey.
Harry J. Combs.
William R. Cone.
Charles I. Cox.
Edward C. Crawford.
Dexter H. Davison.
Walter Dean.
Walter L. Dickson.
Robert Y. Dudley.
Wallace E. Eddy.
Adney J. Elmer.
George E. Everett.
Albert M. Farr.
Charles H. Farrand.
William Fraser.
Arthur L. Fouche.
Wilbur E. Fribley.
Frank H. Gehbe.
Henry W. Glantz.
Alexander W. Glass.
Peter G. Godfrey.
Hart J. Goslee.
Spurgeon D. Gostelow.
Wilbur F. Green.
Alvin T. Grove.
Edgar C. Grove.
Alfred Guthrie.
James P. Harper.
John P. Harvey.
William S. Heaton.
William C. Hessler.
Le Roy E. Hughes.
Louis E. Jelinek.
Augustus C. Jacobs.
David H. Kennedy.
Walter H. Kepner.
Benjamin L. Kirby.
Ora L. Kibler
Ferdinand C. Kloetzer.
Arthur D. Kifner.
Charles W. Lacey.
William F. Lawrenz.
William H. Lee.
George I. Little.
John B. Lucas.
Russell Lyon.
Lewis M. Magill.
John E. Magunson.
Thomas W. McAfee.
Silas E. McDonald.
Chas. D. McDougal.
Ross N. Martin.
Theodore R. Michaelis.
Francis H. Miller.
Arthur W. Morrow.
Marian J. Newman.
Thomas H. O'Neill.
Chas. A. Pankey.
Chas. S. Parker,
Marshall A. Payne.
Walton A. Perkins.
Wilfred E. Perren.
George W. Pfleeger.
Dean R. Phillips.
William A. Pitt.
Samuel H. Pollock.
Edward Reyer.
Louis R. Richardson.
Frank H. Robinson.
Walter A. Rothschild.
William R. Russell.
Martin C. Rifan.
Hugh H. Salmon.
Athanasious J. Sanichas.
John T. Search.
Callanus L. Smith.
Archibald C. Snavely.
Geo. W. Snyder.
Albert F. Solliday.
Chas. J. Sowle.
Ira D. Steele.
Geo. A. Sweetnam.
Geo. E. Tanna.
Mathias A. Thomets.
Edmund G. Tompkins.
Charles C. Trailor.
John E. Trombley.
Peter C. S. Weart.
Ralph H. Washburn.
George N. Wilcox.
Joseph A. Wright.
Edward T. L. York.

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## BIRMINGHAM DENTAL COLLEGE.

THE second annual commencement exercises of the Birmingham Dental College were held at Seal's Academy of Music, Birmingham, Ala., Thursday evening, March 28, 1895.

The address to the class was delivered by Captain Joseph F. Johnson, president of the board of trustees.

The number of matriculates for the session was twenty-four.

The degree of D.D.S. was conferred upon E. A. Wilson, of Alabama, by T. M. Allen, D.D.S., dean.

## UNIVERSITY OF BUFFALO—DENTAL DEPARTMENT.

THE third annual commencement exercises were held, in connection with the Departments of Medicine and Pharmacy, at Music Hall, in the city of Buffalo, on Tuesday, April 30, 1895. After thorough examination by the Board of Curators, including the State Dental Examining Board, the chancellor, upon their recommendation, conferred the degree of Doctor of Dental Surgery upon the following members of the senior class:

Will B. Bartlett.
Charles F. Bunbury.
Gerald G. Burns.
Charles A. Bradshaw.
Fred E. Cloud.
Thomas J. Dorland.
Charles E. Flagg.
Frederic J. Gieser.
William G. Gowland.
Perry C. Hammersmith.
Frank L. Haynes.
Albert Heinrich.
Lott M. Howder.
George L. Hussong.
Harry B. Huver.
Lloyd S. Ingalls.
William E. Jenney.
Clint W. La Salle.
Charles T. Lewis.
John J. Madden.
Henry J. McLellan.
Alfred E. Mimmack.
Bertram A. Moyer.
Thomas C. Phillips.
Miss Annette Rankin.
Albert B. Rieger.
Frank M. Rowland.
John W. Steele.
Harry G. Tripp.
Burdette W. Whipple.

The whole number of matriculates for the session was one hundred and sixty.

## NATIONAL UNIVERSITY—DENTAL DEPARTMENT.

THE annual commencement exercises of the Dental Department of the National University were held (in connection with those of the medical department) in Metzerott Music Hall, Washington, D. C., on Tuesday evening, May 14, 1895.

The address to the graduating classes was delivered by Professor William Mercer Sprigg, M.D., and the valedictory address by Harry Jerome Allen, D.D.S., M.D.

The number of matriculates for the session was thirty-six.

The degree of D.D.S. was conferred on the following graduates of the dental class by the chancellor of the university:

| NAME. | STATE. |
|---|---|
| Harry J. Allen | Dist. Columbia. |
| Llewellyn F. Davis | Maine. |
| Harry P. Davis | Virginia. |
| William W. Hodges | Pennsylvania. |
| Frank D. Magnus | Connecticut. |
| Albert E. McConnell | Dist. Columbia. |
| Ambler A. Marsteller | Virginia. |
| William D. Monroe | Virginia. |
| Nora Moyer | Pennsylvania. |

## COLUMBIAN UNIVERSITY—DENTAL DEPARTMENT.

THE eighth annual commencement of the Dental Department of the Columbian University was held at Metzerott Music Hall, Washington, D. C., on Tuesday, April 30, 1895, at 8 o'clock P.M.

The address to the graduates was delivered by Professor H. B. Noble, D.D.S., and the valedictory by Henry Knowles, D.D.S.

The number of matriculates for the session was sixty-four.

The degree of D.D.S. was conferred on the following graduates by President S. C. Green, D.D.:

| NAME. | STATE OR COUNTRY. | NAME. | STATE OR COUNTRY. |
|---|---|---|---|
| Don F. Aguilera | U. S. Colombia. | Henry Knowles | Georgia. |
| Joseph Cohen | Texas. | Eugene L. LeMerle | Dist. Columbia. |
| James W. Davis | Maine. | Charles W. Orr | New York. |
| William S. Gustin | Ohio. | Will K. Petty | Dist. Columbia. |
| William Hislop | Ontario. | Harry D. Parsons | New York. |
| Robt. E. L. Hackney | Virginia. | William H. Trail | Maryland. |
| J. Everett Keene | Dist. Columbia. | Ernest C. Varela | California. |
| | | Israel G. Warfield | Maryland. |

## INDIANA DENTAL COLLEGE.

The sixteenth annual commencement exercises of the Indiana Dental College were held in the Grand Opera House, Indianapolis, on the evening of March 27, 1895.

The number of matriculates during the past session was one hundred and twenty-six.

The following students were graduated :

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| Carl Bauer | Ohio. | Minnie Masters | Indiana. |
| H. G. Conklin | Ohio. | Otto Michaels | Indiana. |
| S. S. Curry | Florida. | L. M. Mains | Indiana. |
| I. W. Carey | Ohio. | W. W. Mitchell | Indiana. |
| Jesse Emerson | Indiana. | J. F. McDonald | Nova Scotia. |
| R. J. Gillespie | Indiana. | W. E. Pruner | Nebraska. |
| E. H. Grace | Indiana. | M. D. Powell | Indiana. |
| B. M. Harbison | Indiana. | P. C. Reade | Indiana. |
| F. A. Hamilton | Indiana. | H. E. Strain | Indiana. |
| B. F. Johnson | Ohio. | W. M. Van Scoyoc | Illinois. |
| L. L. Kimerer | California. | F. H. Walters | Michigan. |
| H. S. Lee | Illinois. | C. H. Weeks | Ohio. |
| M. E. LeGally | Ohio. | J. G. Wherry | Indiana. |
| C. C. Murphy | Indiana. | | |

# DENTAL SOCIETY ANNOUNCEMENTS.

## AMERICAN DENTAL ASSOCIATION.

The American Dental Association holds its next meeting at Asbury Park, N. J., Tuesday, August 6, 1895. I am requested by the president, Dr. J. Y. Crawford, to give notice that it is the privilege and duty of each state and local society to appoint and send delegates to the American Association.

Each state and local society which has adopted substantially the same code of ethics as that governing the conduct of members of the American Dental Association is entitled to one representative for every five members and fractional part thereof.

Blank certificates for delegates may be had on application to the corresponding secretary.

Many questions of interest will come up for discussion at this meeting, and every dental society in the United States should be fully represented in this, our national convention. EMMA EAMES CHASE, *Cor. Secretary*,
3334 Washington ave., St. Louis, Mo.

## NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

The next meeting of the National Association of Dental Examiners will be held in the parlors of the Hotel Columbia, Asbury Park, N. J., on Monday, August 5, 1895, at 10 A.M., and at other times during the week as becomes necessary between the sessions of the American Dental Association. It is important to have every state board represented. If not already members of the association, we will be glad to have you join with us. Applications for membership can be forwarded at any time, and will receive immediate attention.

Charles A. Meeker, D.D.S., *Secretary*,
29 Fulton street, Newark, N. J.

## TRI-STATE DENTAL MEETING.

To be held at Detroit, Mich., June 18, 19, 20, 1895. Railroad rates from all parts of Ohio, Indiana, and Michigan have been secured on the certificate plan. Purchase a full-fare ticket to Detroit, and get a certificate from the ticket agent to show that you have done so. Bring the certificate to Detroit, have it signed by G. E. Hunt and countersigned by the railroad agent who will be at the meeting, and you can get a return ticket for one-third fare.

The Russell House will be headquarters; rates, $2.50 to $3.00 per day. The Hotel Normandie is close by; rates, $2.00 to $2.50 per day. The clinics and literary sessions will be held in the Dental Department of the Detroit College of Medicine. Following is a partial list of the papers and clinics to be presented:

1. "Etiology and Treatment of Alveolar Hemorrhage." Otto Arnold, Columbus, Ohio.
2. "The Dentist in his Profession and among the People." S. B. Hartman, Fort Wayne, Ind.
3. "Reflex Neuroses of Dental Origin." E. T. Lœffler, Saginaw, Mich.
4. "Generation and Degeneration of the Tissues of the Mouth." W. H. Whitslar, Cleveland, Ohio.
5. "Rhizodontrypy, or Hullihen's Operation." S. D. Brown, Ft. Wayne, Ind.
6. "The Nervous Control of the Circulatory and Respiratory Systems, as related to Syncope and Cocain-Poisoning." A. W. Diack, Detroit, Mich.
7. "The Development of Facial Expression by applying Force to the Teeth." C. S. Case, Chicago, Ill.
8. "The Pathology of Inflammation." G. E. Hunt, Indianapolis, Ind.
9. "Business Education for Professional Men." C. B. Blackmarr, Jackson, Mich.
10. "Some Incompatibilities." J. S. Cassidy, Covington, Ky.
11. "A Method of Teaching Physiology." M. F. Ault, Kokomo, Ind.
12. "Bacteriological Pathology," with lantern illustrations. W. C. Barrett, Buffalo, N. Y.

*Clinics.*

1. The Knapp system of crown- and bridge-work, and use of the Knapp blow-pipe. Dr. Myers, Cleveland, O.
2. The Hollingsworth system of crown- and bridge-work. J. G. Hollingsworth, Kansas City, Mo.

3. Baking porcelain in an electric oven. L. E. Custer, Dayton, O.
4. Baking porcelain in the Downie furnace.
5. Baking porcelain in the Land furnace.
6. Local anesthesia by injection. N. W. Hiatt, Marion, Ind.
7. Local anesthesia by injection. N. S. Hoff, Ann Arbor, Mich.
8. Fusing platinum, using the electric furnace as a rheostat. L. E. Custer, Dayton, O.
9. Filling root-canals with lead points. W. L. Rawls, Indianapolis, Ind.
10. Soft-foil filling. S. T. Kirk, Kokomo, Ind.
11. Staining porcelain teeth. G. H. Wilson, Cleveland, O.

*Program.*

Tuesday, June 18. Morning, papers; afternoon, clinics; evening, papers.

Wednesday, June 19. Morning, papers; afternoon, clinics; evening, Dr. Barrett's lantern lecture.

Thursday, June 20. Morning, papers; afternoon and evening, excursion to St. Clair Flats, and supper.

Everybody come. G. E. HUNT, *Secretary.*

## NEW JERSEY STATE DENTAL SOCIETY.

THE twenty-fifth annual meeting (the Silver Anniversary) of the New Jersey State Dental Society will be held in the Auditorium, Asbury Park, commencing Thursday, August 1, 1895, at 10 A.M., and continuing through Friday, Saturday, and Monday A.M., closing in time for the meeting of the American Dental Association, commencing Tuesday, August 6, at 10 A.M.

The Auditorium is the ideal place for holding a summer dental meeting, being situated in the middle of an entire block fronting the surf, with large windows opening from every side in one continuous row, thirty large windows with north light for clinics, and three hundred and ninety by twenty-five feet for exhibits.

A branch of the Asbury Park Post-Office will be established in the Auditorium, and a bureau for general information, with attendant constantly on hand.

The New Jersey headquarters will be the Hotel Columbia, with rates from $2.50 to $3.00 per day. Several large hotels have made contracts for guests from $2.50 to $4.00 per day, and smaller hotels from $8.00 to $12 00 per week board.

Full particulars and rates, with map of Asbury Park and plan of the Auditorium, will appear in the program.

CHARLES A. MEEKER, D.D.S., *Secretary*,
29 Fulton street, Newark, N. J.

## MISSOURI STATE DENTAL ASSOCIATION.

THE thirty-first annual meeting of the Missouri State Dental Association will be held at Pertle Springs, July 9 to 12, 1895, inclusive. All dentists in Missouri are especially invited to attend, and a cordial invitation is extended to those of other states. It is expected that this will be one of the most interesting meetings in the history of the association

W. M. CARTER, *Cor. Secretary*,
Sedalia, Mo.

## WISCONSIN STATE DENTAL SOCIETY.

THE twenty-fifth annual session of the Wisconsin State Dental Society will convene at Madison, Wis., Tuesday, July 16, 1895, continuing three days. Every effort is being made to celebrate the twenty-fifth birthday, and a cordial invitation is extended to the profession from sister states.

CLAUDE A. SOUTHWELL, D.D.S., *Secretary*,
331 Reed street, Milwaukee, Wis.

## COLORADO STATE DENTAL ASSOCIATION.

THE Colorado State Dental Association will convene in Denver, June 18, 1895, and hold its session three days. The Executive Committee have arranged a very interesting program, and it is hoped that all dentists will avail themselves of the opportunity and be present.

The officers are M. A. Bartleson, D.D.S., Denver, president; A. C. Watson, D.D.S., Denver, first vice-president; E. M. Conard, D.D.S., Leadville, second vice-president; J. S. Donaldson, D.D.S., Denver, recording secretary; Sarah May Townsend, D.D.S., Denver, corresponding secretary; William Smedley, D.D.S., Denver, treasurer.

SARAH MAY TOWNSEND, *Cor. Secretary*,
Denver, Col.

## COLORADO BOARD OF DENTAL EXAMINERS.

THE Colorado State Board of Dental Examiners will meet in Denver, June 18 to 20, 1895.

W. E. GRISWOLD, *President*, Denver, Col.
D. MURRAY, *Secretary*, Greeley, Col.

## PENNSYLVANIA STATE DENTAL EXAMINING BOARD.

THE Pennsylvania State Dental Examining Board will hold its next annual meeting for the transaction of business at Eagle's Mere, Pa., commencing July 9, 1895.

WM. E. MAGILL, *President*, Erie, Pa.
J. C. GREEN, *Secretary*, West Chester, Pa.

## AMERICAN DENTAL SOCIETY OF EUROPE.

THE American Dental Society of Europe will hold its twentieth meeting at Boulogne-sur-Mer, France, August 5, 6, and 7, 1895. It is expected that there will be a very full attendance of the members, and that the meeting will be an interesting one. Any professional brethren who may be spending their holidays in Europe are cordially invited to make their plans so as to be present and take part with us at this meeting.

Programs may be obtained of the president, Dr. Charles W. Jenkins, 1 Sonnenquai, Zürich, Switzerland, or of

DR. J. H. SPAULDING, *Secretary*,
4 Rue de Rome, Paris.

## CALIFORNIA STATE DENTAL ASSOCIATION.

THE twenty-fifth annual meeting of the California State Dental Association will be held at San Francisco, Tuesday, July 9, 1895, and continue four days.

This will be a most interesting meeting, and a cordial invitation is extended to all dentists in our own and other states and territories to meet with us.

L. A. TEAGUE, *President.*
CHAS. E. POST, *Cor. Secretary.*

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# EDITORIAL.

## KALIUM ARSENICOSUM.

IN a paper by Dr. Bauer, of Budapest, the author recommends kalium arsenicosum as an obtundent of hypersensitive dentine. The article, which was originally published in the *Journal für Zahnheilkunde*, has been republished in a number of dental journals, both English and American.

The great need for a reliable obtundent of hypersensitive dentine manifests itself in the readiness on the part of the dental profession to welcome anything which promises to meet that need, and the extensive republication of Dr. Bauer's article is clearly an expression of the interest felt in the subject.

The author, in describing the action and properties of the drug, asserts that kalium arsenicosum has no destroying effects on the mineral constituent parts of the tooth ; no devitalizing effect upon the pulp ; that it acts promptly and safely ; is easy of application and painless ; and that it has no injurious effects should any of it get onto the soft tissues or into the digestive tract.

These qualities he assures us, as the result of much experimenting and investigation, he has found to be possessed by the drug.

It is not our purpose to deny or controvert the assertions of Dr. Bauer, but simply call attention to the fact that kalium arsenicosum is the Latin appellation for potassium arsenite, which salt is the basis of the well-known Fowler's Solution. Potassium arsenite is made by boiling together equal weights of arsenious oxid and potassium carbonate or bicarbonate in distilled water.

The arsenic combines with the potassium to form potassium arsenite with liberation of carbonic oxid. Kalium arsenicosum is a soluble arsenical compound which when taken internally exhibits all of the well-known physiological effects of arsenic upon the system.

It may be within the limits of possibility that arsenic can be so combined chemically with another element as to effect a modification of its well-known pulp-devitalizing property to an extent that might permit of its successful use as an obtundent of hypersensitive dentine without injury to the pulp. Dr. Bauer asserts that kalium arsenicosum is such a combination. The cases which he reports are not sufficiently ample or detailed to warrant a final decision favorable to the therapeutic action of the drug, and it would seem, in view of the nature of the compound, that extreme caution should be exercised in its use until extensive experimentation shall have shown that it may be used with safety. We must confess to a large amount of skepticism with respect to the safety of any arsenical compound as an obtunder of dentine. The experience of the dental profession is practically uniform as to the ultimate devitalizing action of arsenic upon the pulp, no matter how carefully manipulated or applied. The intensity and rapidity of its action may be modified in many ways,—*e.g.*, by dilution, by reduction of the quantity applied, by limiting the time of application, or by combination with other materials; but sooner or later inflammation and death of the pulp is the sequel. Other arsenical compounds, as well as arsenic and its oxids, have been found to produce the same ultimate result. For example, cobalt (native cobalt arsenide), sodium arsenite, the chemical analogue of kalium arsenicosum, and cocain arsenite all will cause death of the pulp, and all have, when properly applied, a preliminary obtunding effect which is but the forerunner of devitalization, the sleep of death. Kalium arsenicosum may be the one exception, but it has, to put it mildly, very bad family relationships.

## DENTISTS AND JURY DUTY.

In the Dental Cosmos for February, 1894, we called attention to the decision of the Supreme Court of Missouri, unfavorable to the exemption of dentists from jury duty. This decision was handed down December 5, 1893. The manifest inconsistency of the decision was shown in the closing portion, which we quoted. That the matter was at least a debatable one was further evinced by the fact that of the seven judges, three dissented from the verdict given. We have always contended that the only correct basis upon which exemption of dentists from jury duty can be legally secured is the prior right of the public to the services of the dentist, which is the same basis upon which exemption of the physician is permitted. Whenever the effort is made to secure the exemption of the dentist upon any other basis, it becomes a demand for a special privilege, a species of class legislation repugnant to the underlying motive spirit of all legislative action.

We are pleased to learn that a more recent effort has been made in Missouri to secure exemption of dentists from jury duty, and that it has met with success.

The following extract from the text of the law, which goes into effect June 21, 1895, is interesting not only because it provides for the exemption desired, but because it clearly defines the legal status of the dentist as a medical specialist upon the same plane as other special practitioners of the healing art:

> AN ACT to amend Section 6062, Chapter 93, Revised Statutes, 1889, entitled "Juries Grand and Petit."
>
> *Be it enacted by the General Assembly of the State of Missouri, as follows:*
>
> SECTION 1. That Section 6062, Chapter 93, Revised Statutes of 1889, be amended by adding after the word "medicine," in the fifth line of said section, the following words: "All persons lawfully practicing as aurists, oculists, dentists, or other specialists, being included in the term practitioner of medicine;" so that said section shall read as follows:
>
> SECTION 6062. Persons exempt from service. No person being a member of any volunteer fire company, duly organized and ready for active service, no persons employed in any paid fire department nor in any state eleemosynary institution, and no person exercising the functions of a clergyman, practitioner of medicine (all persons lawfully practicing as aurists, oculists, dentists, or other specialists, being included in the term practitioner of medicine), or attorney-at-law, clerk or other officer of any court, ferry-keeper, druggist, postmaster, overseer of roads, coroner, constable, miller, professor or other teacher in any school or institution of learning, judge of a court of record, superintendent of county poor-house or houses, or any person over the age of sixty-five years, shall be compelled to serve on any jury.

The precedent thus established by Missouri should be followed up by similar legislation until all of the states have enacted laws to the same end.

## TAX-FREE ALCOHOL.

WE take this occasion to thank a considerable number of readers who have responded to our request for data as to the amount of alcohol consumed in their work annually, and shall be pleased to have additional reports on the subject from a still larger number.

## BIBLIOGRAPHICAL.

HYPNOTISM: HOW IT IS DONE; ITS USES AND DANGERS. By JAMES R. COCKE, M.D. Boston: Arena Publishing Co., 1894. 12mo, pp. 373. Price, $1.50.

The recent revival of interest in the phenomena of hypnosis and kindred psychological states has developed a number of valuable contributions to the literature of this field of investigation. The author of the present volume has brought to the study of the facts sound common sense and the judgment of the trained physician. In his account of the methods of producing hypnosis, of the leading phenomena to be observed, of its therapeutic value and of the danger attending its use, he is substantially in accord with the greatest authorities, and it is refreshing to find in a book which must necessarily contain records of facts that appeal to the sense of the marvelous, a thorough, almost studied, indifference to their sensational aspect, and an earnest endeavor to bring them within the scope of present scientific conceptions. Yet it is precisely in this effort that Dr. Cocke is least successful. Viewing the facts, as he does, with the eyes of the physician, he falls at every step into the "physician's fallacy" of classification.

It is evident that he accepts hypnosis as a fixed and definite entity, a something analogous to the recognized diseases of medicine, and finds traces of it in many at present little-understood phenomena. Thus the phenomena of the spiritistic seance are to be attributed to "autohypnosis." So are automatic writing, hallucinations, and all other forms of automatism when not extraneously induced, and dependent upon a form of hysteria which is latent in the entire community. The book would have had increased value had the author been as keen a psychologist as physician.

His "latent hysteria" is as pure a figment of the imagination devised to unify a group of symptoms as any that the old psychologies contained. Dr. Cocke's insight has showed him that hypnosis, hysteria, suggestibility, and all the manifold forms of automatism have a common basis, but he has not shown what that basis is.

The vivid account of the author's personal experience in hypnosis, as well as his record of the phenomena which he has observed in patients, are most valuable as a record of facts.

From the purely theoretical point of view the book is not of great importance, but in its array of facts and the practical conclusions based thereon it leaves little to be desired.

WORLD'S HISTORY AND REVIEW OF DENTISTRY. By HERMAN LENNMALM, D.D.S. Chicago: W. B. Conkey Company, 1894. Octavo, pp. 420.

This work is hardly fairly represented in its title, inasmuch as the historical phase is comprised in a few pages which give but brief mention of a limited number of important events connected with dental history. The work consists mainly of a compilation of the legal enactments of the principal countries of the world, regulating the practice of dentistry. Data respecting dental colleges and dental periodicals are also given, which, taken together, form a work of some value as a book of reference in the lines indicated.

THE TREATMENT OF WOUNDS, ULCERS, AND ABSCESSES. By W. WATSON CHEYNE, M.B., F.R.S., F.R.C.S., Professor of Surgery in King's College, London. 12mo, pp. 207. Philadelphia, Lea Brothers & Co., 1895. Price, cloth, $1.25.

This little book is to be commended as an excellent example of the practical application of scientific facts. The author has digested well the data of bacteriology, and made them the basis of a rational therapeusis. His perspicuity of style provides a volume well adapted to the use of both students and practitioners.

An interesting feature is a consideration of the quantitative and qualitative relations of micro-organisms. Although entirely up to date, the author is conservative in his views. The inherent resistance of tissues is discussed, and given the prominence belonging to this safeguard.

As a surgical curiosity, the German method of operating literally in a glass case is described. It contains much of special interest to the dental practitioner, as the principles involved concern him as much as the general surgeon. H. B.

THE YEAR-BOOK OF TREATMENT FOR 1895. A Comprehensive and Critical Review for Practitioners of Medicine and Surgery. 12mo, pp. 501. Philadelphia, Lea Brothers & Co., 1895. Price, cloth, $1.50.

The intrinsic value of such books as this is recognized by an ever-growing circle of practitioners. They bridge the hiatus between successive editions of text-books, and, through their teaching, advances in therapeutic practice receive earlier application than would be possible without such means.

Year by year volumes like this grow in interest to the dental practitioner, particularly to those of the class who are becoming properly viewed as stomatologists.

The book is an improvement even upon its predecessors. In the section on gout and rheumatism, by Dr. Archibald E. Garrod, Dr. E. C. Kirk (*Lancet*, 1894, p. 1614) is quoted as commending the use of lithium carbonate in preference to the citrate. Dr. Kirk advocated the use of lithium bitartrate, not carbonate, in the essay quoted. H. B.

## PAMPHLETS RECEIVED.

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The Present Scientific Status of Hypnotism. By W. Xavier Sudduth, A.M., M.D., D.D.S. Reprinted from the *Dental Review*, 1895.

Transactions of the Midwinter Fair Dental Congress, held in San Francisco, commencing June 11, 1894. San Francisco, Bacon Printing Company, 1895.

Transactions of the Twenty-fifth Annual Session of the Southern Dental Association, August 2 to 6, 1894. Philadelphia, The Wilmington Dental Manufacturing Company, 1895.

Anatomie de la Région Ptérygo-Maxillaire. Par le Dr. Ernest Juvara, assistant a l'institut anatomique et chirurgical de Bugarest. Paris, L. Battaile & Cie, 1895.

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# OBITUARY.

## DR. FABER BANGE.

DIED, at his home in Hanover, Pa., April 14, 1895, of consumption, Dr. FABER BANGE, in the forty-first year of his age.

Dr. Bange was born in Hanover, Pa., June 9, 1854. He was a son of the late William H. Bange; studied dentistry with his father, and was also a student of the late Marshall Webb. He was associated with his father in practice from 1876 to 1882, when, upon the death of his father, he continued the practice for himself.

As a dentist Dr. Bange had few superiors. Possessed of remarkable skill, he soon built up for himself a large and lucrative practice, and won a host of friends; but failing health compelled him the last few months to desist from all active business. He was married in June, 1891, to Miss Annie M. Shaffer, who survives him. M. D. B.

## DR. GEORGE T. MOFFATT.

DIED, in Boston, Mass., April 2, 1895, of cerebral congestion, GEORGE TUFTON MOFFATT, M.D., D.M.D., in the fifty-ninth year of his age.

Dr. Moffatt was born at Roxbury, Mass., August 7, 1836. He studied dentistry with Dr. Joshua Tucker, and entered upon practice about 1856. In 1860 he received the degree of M.D. from Harvard University, and was given the honorary degree of D.M.D. in 1870 from the same institution. He was professor of operative dentistry in the Dental School of Harvard University from 1868 to 1879.

Dr. Moffatt was a member of the American Academy of Dental Science, of which he was successively secretary, treasurer, and president; of the New York Odontological Society, of the Odontological Society of Great Britain, of the Connecticut Valley Dental Society, of the Massachusetts Dental Society (and at one time its president), of the Massachusetts Medical Society, and an honorary member of many other bodies.

In 1872 Dr. Moffatt was married to Miss Emma A. Patterson, of Boston. They had three children, and two sons survive.

# DENTAL LEGISLATION.

## MONTANA'S DENTAL LAW.

FOLLOWING is the text of an act to regulate the practice of dentistry in the state of Montana, which was recently passed by the legislature and approved by the governor, March 12, 1895.

*Be it enacted by the Legislative Assembly of the State of Montana:*

SECTION 1. It shall be unlawful for any person, who is not at the time of the passage of this act engaged in the practice of dentistry in this state, to commence such practice unless he or she shall have obtained a certificate, as hereinafter provided.

SEC. 2. A board of dental examiners, to consist of five practicing dentists, is hereby created, whose duty it shall be to carry out the purposes and enforce the provisions of this act. The members of said board shall be appointed by the governor from the state at large. The term for which the members of said board shall hold their office shall be five years, except that the members of said board first appointed under this act shall hold their office for the term of one, two, three, four, and five years, respectively, and until their successors shall be duly appointed, the tenures of which term shall be determined by lot. In case of a vacancy occurring in said board, such vacancy shall be filled by the governor from the state at large. Not more than two members of the said board shall be appointed from any one county. Each person appointed as a member of the board of dental examiners shall qualify by taking the oath prescribed by the constitution for state officers.

SEC. 3. Said board shall provide an official seal. The first meeting of said board shall take place at the city of Helena, on the tenth day of May, 1895. Said board shall choose one of its members president, and one secretary thereof, and it shall meet at least once in each year, and as much oftener and at such times and places as it may deem necessary. A majority of said board shall, at all times, constitute a quorum, and the proceedings thereof shall, at all reasonable times, be open to public inspection

SEC. 4. Within four months from the time this act takes effect, it shall be the duty of every person who is now engaged in the practice of dentistry in this state, to cause his or her name and residence, or place of business, to be registered with said board of examiners, who shall keep a book for that purpose. The statement of every such person shall be verified under oath before a notary public or justice of the peace in such manner as shall be prescribed by the board of examiners. Every person who shall so register with the said board as practitioner of dentistry shall receive a certificate to that effect, without examination, and may continue to practice as such without incurring any of the liabilities or penalties provided in this act, and shall pay to the board of examiners for such registration and certificate the fee of three dollars.

SEC. 5. Any person or persons who desire to begin the practice of dentistry in the state of Montana after the passage of this act, shall present a diploma or a certified copy thereof to the board of examiners for their approval, or shall appear before said board at any of its regular or special meetings for examination. To be eligible for such examination the applicant shall give satisfactory evidence of having practiced dentistry three years, or having been a bona fide student three years under the immediate supervision of a licensed dentist. The examination shall be elementary and practical, but sufficiently thorough to test the ability of the applicant to practice dentistry. It shall include anatomy, physiology, chemistry, dental medicine, metallurgy, histology, pathology, operative, surgical, and mechanical dentistry, and also demonstration in operative and mechanical dentistry. If the examination shall prove satisfactory to said board of dental examiners, they shall issue a certificate of registration to the person examined. Said board shall indorse as satisfactory the diploma when from any reputable dental college, when satisfied as to the character of such institution, and upon the holder of such diploma furnishing satisfactory evidence of his or her right to the same. All certificates issued by said board shall be signed by its president and secretary, and shall have its official seal attached thereto.

SEC. 6. Every person who shall receive a certificate of registration from said board shall within sixty days after the issuance thereof cause his or her certificate to be filed with the clerk of the county of his or her residence, or with the clerk of any other county or counties in which he or she may desire to engage in the practice of dentistry. The clerk of the county shall charge for registering such certificate the regular fee for such services, and after registering the certificate, shall return it to the person to whom the same was originally issued.

Any person who shall fail to register his or her certificate shall be liable for practicing dentistry without license.

SEC. 7. It shall be the duty of the county clerk to keep a book to be entitled "Dental Register," which book shall contain a complete alphabetical list of all certificates of registration filed in his office, and which book shall be provided with columns, giving the name and residence of the dentist, together with the date of the certificate, and the date of its filing with the clerk and the date of revocation.

SEC. 8. Any member of the board of dental examiners may, upon examination, grant a certificate to an applicant to practice dentistry until the next meeting of the said board, when he shall report the fact, at which time the temporary certificate shall expire. But such temporary certificate shall not be granted by a member of the board after the board has once rejected the applicant.

SEC. 9. All persons shall be held to be practicing dentistry within the meaning of this act who shall charge a fee or salary, or other reward, paid either to him or to another person, for operations or parts of operations of any kind, in the treatment of diseases or lesions of human teeth or jaws, or in the correction of the malpositions thereof. But nothing in this act contained shall be taken to apply to physicians who may desire to extract teeth, or to the acts of bona fide students of dentistry, done under the immediate supervision of a preceptor or a licensed dentist in this state.

SEC. 10. In order to provide means for carrying out and maintaining the provisions of this act, the said board of dental examiners may charge each person applying to or appearing before them for examination, a fee of fifteen dollars, and for each diploma presented for approval after April 10, 1895, a fee of ten dollars. In no case will these fees be returned. Every registered dentist shall, in each and every year after the year of 1895, pay to the board of dental examiners a fee of one dollar, as his annual dues, such payment to be made on or before the *first day of May of each year*. In case of default in such payment by any person, his or her certificate may be revoked by the board of dental examiners upon thirty days' notice to the person holding such certificate, unless within such thirty days said annual dues shall be paid, together with such penalty as the board may impose, and the board is expressly authorized to impose a penalty of five dollars as a consideration for allowing the certificate to remain unrevoked.

SEC. 11. Out of the funds coming into the possession of the said board, each of the members may receive as compensation the sum of five dollars for each day actually engaged in the duties of their office, together with all legitimate and necessary expenses incurred in attending the meetings of said board. No part of the compensation or other expenses of the said board shall be paid out of the state treasury The fees coming into the treasury of said board shall be paid out upon the warrant of the president and the secretary thereof, in payment of the compensation and expenses of said board in carrying out the provisions of this act. Said board shall make an annual report of its proceedings to the governor of this state for the year ending on the thirty-first day of December preceding such report.

Said report shall be filed with the governor on or before the fifteenth day of January of each year.

SEC. 12 Any person who shall violate any of the provisions of this act, or who shall knowingly or falsely claim to have or hold a certificate of registration, license, diploma, or degree granted by any society or board of dental examiners, or who shall falsely and with intent to deceive the public, claim or pretend to be the graduate of any incorporated, reputable dental college, or who shall have registered under one name and practice dentistry under another name, with intent to deceive the public, shall be deemed guilty of a misdemeanor, and, upon conviction, may be fined not less than fifty dollars, and not more than two hundred dollars, or be confined in the county jail not less than one month nor more than three months, or may be punished with both such fine and imprisonment. All fines thus received shall be paid into the common-school fund of the county in which such conviction takes place.

SEC. 13. This act shall take effect immediately.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.

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**Dumont** (Louis.) * Contribution à l'étude de la pathogénie des phlegmons péri-maxillaires d'origine dentaire. Paris, 1894, 149 p. 4°. No. 418 *.

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**Kleinsorgen** (Fritz.) Ueber Neubildungen der Zahnpulpa. Bonn, 1894, E. Heydorn, 45 p. 8°. *

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## PERTAINING OR APPLICABLE TO DENTISTRY

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THE

# DENTAL COSMOS.

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## ORIGINAL COMMUNICATIONS.

### AN INVESTIGATION OF THE PHYSICAL CHARACTERS OF THE HUMAN TEETH IN RELATION TO THEIR DISEASES, AND TO PRACTICAL DENTAL OPERATIONS, TOGETHER WITH THE PHYSICAL CHARACTERS OF FILLING-MATERIALS.

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(Continued from page 484.)

*Third Paper.*

### Filling-Materials.

When it is required that a bridge be constructed for a railway over a stream of any considerable magnitude, the civil engineer to whom the formation of plans is referred will first ascertain the condition of the ground in which his foundations must be placed, and the weight of the trains which it is expected will cross the structure. Then he will proceed to develop his plans, studying each part of the stone and iron work as to its strength in the position placed. If he be wise he will add largely to the actual strength required in order that it may be sufficient to bear any reasonable degree of unforeseen stress, or overcome a failure of some beam or girder which may fall below the calculated strength. This overplus of strength is considered necessary in all such engineering operations.

In the use of filling-materials with which carious cavities in the human teeth are repaired, it would seem that similar inquiries should be made as to the strength of the material used as well as to its chemical qualities. This strength should have some relation to the strength of the teeth, and to the force with which they are brought in occlusion, both in their ordinary uses and in their extraordinary uses. Indeed, if fillings are expected to endure, the material should have sufficient strength to bear without injury the greatest stress the human jaws are able to bring upon it, and continue to do this year after year continuously.

In my paper in the May issue of the Cosmos the strength of the teeth which serve as the foundations of fillings was examined, and in the June issue the extraordinary and the ordinary stresses to which they will be subjected in mastication was determined. In these examinations it was found that the teeth when normal are, all of them, abundantly strong, and have strength to spare in such degree that when considerably weakened by caries they have still sufficient strength to support fillings against both the ordinary and the extraordinary stresses brought upon them in mastication, provided these are properly anchored into their substance. However, the filling-material itself, if it is to endure, must be sufficiently strong to bear this stress continuously as it comes upon it thrust after thrust, year after year.

The stress in the ordinary use of the teeth has been shown to be from sixty to eighty pounds upon the area of two molars of medium size. This, if evenly distributed, would give from seven and a half to ten pounds on a filling occupying one-fourth the area of one of these teeth. This would be a filling of ordinary size. But it frequently happens that the filling must bear all of this stress, and occasionally such fillings must bear all of the stress that the person is capable of exerting. Therefore, while the filling itself may not have to endure a stress of more than seven and a half to ten pounds in chewing a piece of beefsteak, it is continually liable to have to bear the whole stress when some hard substance is caught upon it, or even the whole stress the person can exert. This may be anywhere from one to two hundred pounds, or even a greater stress in some cases. Gold and amalgam are the only filling-materials in general use that are supposed to be able to endure this stress continuously. Fillings of other materials are therefore regarded as temporary structures when placed in positions of exposure to the stress of mastication.

### Silver-Tin Amalgams.

The silver-tin amalgams at present in use are alloys composed of silver and tin, and which are cut into filings, or shavings, and combined by amalgamating, or mixing with mercury. These alloys are composed of varying proportions of silver and tin, this variation ranging from sixty parts of silver to forty parts of tin, to forty parts of silver to sixty parts of tin. Occasionally alloys are made with a larger proportion of silver. The greater number of the alloys at present in use have additions of small quantities of other metals, such as gold, platinum, iridium, copper, zinc, bismuth, etc. These alloys are mixed with varying proportions of mercury, which may be said to range in ordinary practice from thirty per cent. of mercury to seventy per cent. of alloy to equal parts of each by weight, or, exceptionally, a larger proportion of mercury may be used. The mercury is mixed with the filings or shavings by rubbing them together in a wedgwood mortar, or in the hand, until a more or less smooth paste is formed, or, if the quantity of mercury is too small for this, a dark semi-coherent powder. When considerable mercury is used in mixing, it is the common practice to remove the excess by wringing it out through muslin or chamois skin. This mass when packed together acquires a metallic hardness within a few hours, and its full degree of hardness, usually, in twenty-four to forty-eight hours. It is then a hard, brittle mass that may be dressed with a file and polished as other metallic bodies.

This material has already a somewhat extensive literature. Indeed, the question of its properties, and its fitness as a filling-material, has given rise to much discussion and a large amount of experimental research. I have not space in this paper to review this literature, however desirable such a review may be. But it has in nowise been ignored, but has been the foundation from which the present work has proceeded, and the absence of a review is purely a matter of lack of space.

It has been the intention to conduct a series of experiments upon the physical properties of amalgams upon the same general lines of research as those that have been found most satisfactory and reliable in the investigation of the resistance and elasticity of the metals used for engineering purposes, as railway bridges, buildings, etc., in which endurance and weight become important factors. These plans of experimental work have been well tried in the past, and have met the approval of the most learned engineers. For this purpose it has been necessary to devise and build apparatus adapted to the small masses of material used in making fillings. The endeavor has been to so arrange the detail of this work that others could follow it with the least difficulty for the verification of the results or correction of errors into which I may fall. In furtherance of this design, illustrations from photographs of the apparatus used will be made as complete as possible. It is not expected that I will be able to make this experimental work complete, but rather the effort will be to establish lines of procedure in the study of this important material which are more strictly in harmony with the laws of physics than those previously employed, and which may be extended and perfected by others.

I wish to thank manufacturers of dental goods for the hearty support they have given me in this work. When it was announced to them that I would undertake an investigation of the physical properties of amalgams, I received within a few weeks about eighty different alloys. A number of manufacturers have also given me their formulæ, thus enabling me to conduct the investigation on purely scientific lines. These formulæ are trade secrets, which must be respected, therefore no name will be connected with any formula given. I know of no other way in which the results of such an investigation could be made available to dealers in amalgams and the profession alike. I and the whole dental profession are under obligation to those of the trade who have so generously supported this effort. Those who have furnished amalgams and have had no definite report of them will easily see by the following pages that even a partial test of so many alloys has been impossible, and, also, that so far as the investigation has proceeded the range of formulæ has been such as to answer to almost any alloy.

A silver-tin amalgam, when fully hardened, has the appearance of a hard, brittle, metallic body. This brittleness is very pronounced. When struck with a hammer, it breaks into thousands of fragments. If more stress is placed upon it than it is able to endure by turning up the screw of the dynamometer, it goes to pieces with a crash resembling that of glass. These facts have given rise to the notion that this characteristic brittleness was the essential physical property of amalgams; or, in other words, to the notion that an amalgam, when fully hard, would support stress to the extent of its endurance and then crush, but that it was not otherwise subject to change of form under stress. This inference was justified by the general range of the physical properties of the metals. Cast iron is brittle, hardened steel is brittle, wrought iron is ductile, soft or untempered steel is ductile. Neither of these is both brittle and ductile at the same time. These two properties of the metals have generally been considered as opposites, the one being absent in proportion to the presence of the other. In this particular the silver-tin amalgams seem to be an anomaly among the metallic compounds, for *they are at the same time both very brittle and very ductile.* If struck with a hammer they fly to pieces ; but if subjected to a comparatively light stress, either continuous or intermitting, they may be drawn out into thin laminæ or molded into any form without breakage. It seems that this heretofore unsuspected dual property of the silver-tin amalgams has given rise to much misconception as to the causes of their behavior under the conditions to which this material has been subjected as fillings in teeth, and in experimental study.

In the study of these properties of the silver-tin amalgams, it is necessary to use instruments with which such stress as will crush them can be accurately measured, and also with which a less stress can be continuously exerted and the movement or yielding of the amalgam be measured. For this purpose I have used the dynamometer with micrometer attachment illustrated in the issue of the Cosmos for May, the same instrument with which the strength and elasticity of the dentine was studied (see illustration and description). With this instrument a block of amalgam of measured size may be subjected to any degree of stress and the effects noted. The stress may be turned on until the amalgam crushes, or a lighter stress may be placed upon it and maintained for any given period, and the yielding of the amalgam measured with the micrometer.

In order to render this form of study effective, it has been necessary to devise means of forming the amalgam into definite measurable forms and sizes. For this purpose the instrument illustrated in Figs. 8 and 9 was devised. It will be readily understood by a study of the cuts, with their description. The forms chosen were cubes or square blocks, and the sizes used have been 85 x 85 x 85 thousandths of an inch, 10 x 10 x 10 thousandths of an inch, and 130 x 130 x 130 thousandths of an inch. (All measurements will be given in thousandths of an inch.) For all general work the small sizes have been used, for the reason that often the larger sizes could not be crushed with a stress of 350 pounds, the full capacity of my instrument. For various experiments where the modes of manipulation were to be particularly tested, the large blocks have been used, because they gave more facility in manipulation.

When one of the smaller blocks is placed in the dynamometer and the stress turned on rapidly by means of the screw, it is found to crush, usually, when the stress reaches two to three hundred pounds, varying with the alloy and the amount of mercury used in making the mass. It simply goes to pieces with a crash, the particles of amalgam flying in every direction. But if the stress is turned on until twenty-five, fifty, or one hundred pounds is reached, and maintained at one of these figures, quite another phenomenon will be discovered. The index needle of the micrometer will show that *the amalgam block is gradually yielding to the stress.* Now the time may be taken and the rapidity of this yielding measured, as the amount

FIG. 8.

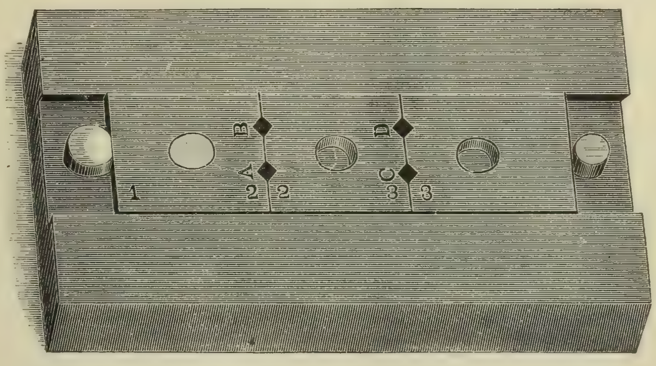
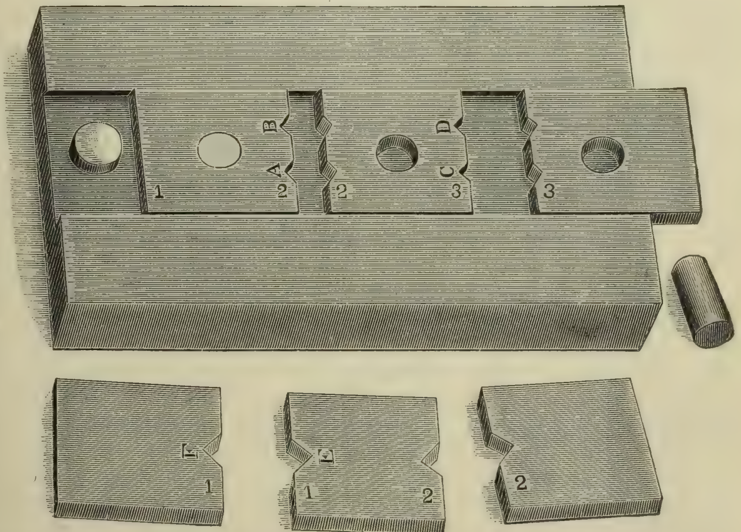


FIG. 9.



FIGS. 8 AND 9.—An instrument, or apparatus, for forming amalgam, or other filling-material, into blocks for experimental tests of weight, strength, or flow. (Full size.)

In a plane block of steel 3 x 1¾ x ½ inches, a slot is cut with a planing-machine three-quarters of an inch wide and one-sixteenth of an inch deep, the margins of which are undercut at an angle of twenty degrees. A slab of steel is fitted accurately into this slot, but so as to slide easily. The slab is then cut into three pieces as shown, and the ends ground to fit each other accurately. In these ends parts of squares are cut in such a way that when the pieces are placed together in the slot perfectly square holes will be formed as shown, after which they are hardened and the fitting completed. In either end of the block pins are placed to hold the pieces in place, the one permanently placed and the other movable; the movable one being slightly conical, so that when forced home the pieces will be held firmly together, as shown in Fig. 8. These square holes serve as cavities to be filled with amalgam, or other filling-material, to be examined. Then the movable pin is drawn and the apparatus opened, as shown in Fig. 9, and the filling released. Different thicknesses of steel pieces are used in the same block for different sizes of cavities. A second set of these are shown in Fig. 9. The round holes seen in the steel pieces are ground to perfect edges, and are used for the examination of the margins of amalgam fillings by placing them on the stage of the microscope.

of yielding in one hour, in two hours, in six hours, in one day, or in two or more days. In this way we may test the stability or instability of the various alloys, and fix the rate at which they will yield to a given stress.

For the want of a better term, I shall call this yielding of amalgam *the flow of amalgam under stress*, or simply the *flow*. I wish to say, however, that it is something quite different from that which is described as "*the flow of solids*" in works on engineering. Burr* describes the flow of solids as the movement that takes place among the particles of a malleable metal, upon or among themselves, when the mass is struck or pressed upon with such force as to change its form, and illustrates this by a diagram of the change of form and the movements (flow) of the particles of metal in an iron nut when a hole is punched through it. This flow is the same in one sense as in amalgam. But in iron, steel, gold, silver, and all of the metals, except tin and a few others of the soft metals, a given stress will cause a certain flow, which occurs immediately and ceases within one or two minutes after the stress is applied, although the stress be maintained. An increase of the stress produces an increased flow, which again ceases until there is an increase of the stress. The flow of amalgam is different in this; when the flow has begun, it continues as long as the stress is maintained. No increase of the stress is required to maintain the flow, even after the area of the amalgam has been greatly increased by the flattening of the mass between plain surfaces. If a stress of fifty pounds be put upon a block of amalgam one-tenth of an inch square, and maintained for one hour, flow will occur at a certain rate; if the stress be reduced to twenty-five pounds, the flow will continue, but at a reduced rate. There is a manifest disposition of the material to creep out from under a load. It will go slowly with a light stress, somewhat quicker with a heavier stress, but it cannot be made to go very quickly with a very heavy stress; it will break into fragments. A silver-tin amalgam is not malleable.

In all cases I shall represent this flow in percentages. For instance, if we place a block of amalgam 85 x 85 x 85 thousandths of an inch under a stress of fifty pounds, it will be reduced almost immediately to, say eighty-two thousandths, enough so that any unevenness of the surface of the amalgam will be reduced and all parts become perfectly fitted to the surface of the steel. This measurement of eighty-two thousandths of an inch is then taken as the starting-point, and the time noted. At the end of one hour the micrometer is again read. If at that time the thickness of the block is reduced to seventy-four thousandths of an inch, a calculation will show a reduction of thickness of ten per cent., accompanied with a corresponding lateral expansion. The flow is ten per cent.

This is a property that is so unusual among the metals and their alloys, that it may be difficult to fully comprehend it. Its importance is so great that I will describe it somewhat in detail, though as briefly as possible.

Tin and silver were subjected to examination. Tin is one of the soft, malleable metals. Blocks of chemically pure tin were formed by filing down a cast bar a little below the size of the small cavities in the apparatus illustrated in Figs. 8 and 9, and driven into the cavity with a small hammer until it was perfectly filled, and then dressed level with the surface. This was placed under a stress of fifteen pounds and the flow noted, taking the time after two minutes.

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*"The Elasticity and Resistance of the Materials of Engineering."

In 10 minutes the flow was 3.71 per cent.
" 20 " " " " 4.92 "
" 1 hour " " " 6.57 "
" 6 hours " " " 10.37 "
" 12 " " " " 22.22 "
" 24 " " " " 33.33 "

From an ingot of silver (999 silver and 1 of gold, U. S. assay) a cube was cut which measured 140 x 132 x 132 thousandths of an inch. This was placed in the dynamometer on dimension 140, and a steel point 80 x 80 applied on its center, and two hundred pounds turned on. It sank four per cent. at once. In ten minutes the movement of the needle indicated about five-thousandths of one per cent. more. After seven hours there was no further movement. After twenty-four hours more there was no further flow.

This result would indicate that in amalgams the disposition to flow was imparted by the tin, but an examination of blocks cut from an alloy of equal parts of silver and tin proved it to be as resistant as pure silver. The logical conclusion is therefore that the flow results from the combination of the three metals, the tin, silver, and mercury.

In this property of flowing the silver-tin amalgams are remarkably sensitive, so much so that seemingly trivial differences in mixing and working the mass produce wide differences in the percentages of flow. In the beginning of the work on this subject I found it impracticable to make a number of blocks, even from the same mix of amalgam, that would flow alike. I will give an example from among my first experiments.

An alloy of the following formula: Silver 47.06, tin 51.76, copper .94, zinc .24, was mixed with mercury by grinding in a wedgwood mortar, as is ordinarily done in filling teeth. The mass was divided into two parts. One of these was wrung out through muslin. Of this four blocks were made with mallet force, removing as much of the mercury as possible while packing. Of this same portion of the mass four more blocks were made by hand-pressure, being careful to remove no mercury while packing. A third set of four blocks was from the portion of the mass not wrung out. Two days afterward all of the blocks were tested with a stress of fifty pounds. Of the first set, the first block gave a flow of 17.07 per cent. in one hour. The second 36.58 per cent. The third 23.57 per cent. The fourth crushed at 255 pounds.

Of the second set, the first gave a flow of 23.63 per cent. The second 72.12 per cent. The third 22.41 per cent. The fourth crushed at 240 pounds.

Of the third set, the first gave a flow of 89 per cent. within ten minutes, without any break or crumbling; it simply spread out in a thin sheet. The second block crushed at 40 pounds. The third block gave a flow of 69.13 per cent. in one hour. The fourth was found imperfect, and no test was made.

This alloy was mixed and used as different dentists mix and use amalgams in filling teeth, and certainly with as much care as is generally bestowed upon it. Yet the results show a variation that must astonish the reader as these results astonished me. The third series of blocks were of course mixed with entirely too much mercury, but the others were fairly dry, and were as carefully placed in the cavities as is customary in filling teeth, using the method of mallet-force in the one case, and the method of hand-pressure with serrated points in the other. I thought I had packed them with a fair degree of care. Yet there was no regularity in the results, as is shown by the flow differing fifty per cent. in the different blocks made from the same mix of alloy, and, as supposed, treated in the same way.

I made a large number of experiments in this way, without obtaining any regularity of results. The idea that I was unable, after thirty years of experience, to make two fillings from the same mix of material that would test any nearer alike than those just given, was humiliating. Is it any wonder that results in the use of amalgam are irregular, and, while often good, are very often disappointing?

But, believing that there must be reasons for these differences in flow, it was determined that a series of experiments should be conducted so carefully as to develop them. In this series the formula of each alloy was known, the alloy and the mercury were weighed, the loss in mixing was recorded, the loss of mercury in wringing out was determined, and the percentage of mercury remaining in the mass when ready for use was accurately determined, and all made a matter of record. Then every movement in making the fillings was noted, even to the number of thrusts of the instrument and the amount of force used, the plan of the work, whether or not mercury was removed in packing the filling; every detail was recorded in my book of notes. This manner of working soon gave results that developed the conditions which tend to increase or diminish the flow. The notes of this work are much too voluminous to be given in detail, but the principal facts can be condensed into a few pages. As a result of three months of close experimental study, the following results, obtained from the same formula and the same package of alloy as that given above, may be interesting:

℞—Mercury, 1.060 milligrams;
Alloy, 1.060 milligrams.

Mass mixed in hand, 2.052 milligrams.
Loss in mixing, 0.068 milligram.
Mass wrung out, 1.675 milligrams.
Mercury removed, 0.377 milligram.
Final mass: Mercury, 38.47 per cent.; Alloy, 61.26 per cent.

Fillings made with a broad, serrated point, removing no mercury: Made March 25, 1895. Tests, March 27, 1895.

| BLOCK. | TIME. | STRESS. | PERCENTAGE OF FLOW. |
|---|---|---|---|
| 1. | Made immediately after mixing. | 60 lbs. for 1 hour. | 25.60 |
| 2. | " 10 minutes " " | crushed at 235 lbs. | |
| 3. | " 20 " " " | 60 lbs. for 1 hour. | 24.69 |
| 4. | " 30 " " " | crushed at 235 lbs. | |
| 5. | " 40 " " " | 60 lbs. for 1 hour. | 25.00 |

Made at same time of same mass. Tests, March 29, 1895.

| | | | |
|---|---|---|---|
| 6. | Made 30 minutes after mixing. | 60 lbs. for 1 hour. | 24.94 |
| 7. | " 40 " " " | 60 lbs. for 1 hour. | 25.00 |

This test is from one of a series for determining the influence on the results produced by the time elapsing between the time the mix is made and the time at which the mass is packed. The results show that so long as the mass can be successfully packed, there will be practically no difference in its strength. My first experiments gave the preference to the last blocks made, even up to one hour ; but, as more perfect regularity in packing was attained, this disappeared.

The general principle developed in this work is, that in order to attain regularity in the flow of the mass perfect regularity in the packing must be observed. After a careful study of my notes, the idea that I get is that the strength of the mass depends mostly on the *perfect evenness of the distribution of the mercury.* Any irregularity in the work which disturbs this increases the flow. Therefore, the plan adopted in the beginning must be carried out to the letter to the end, if strong fillings are to be made. The particular plan is of less consequence. But the different plans give different results. The strongest mass I have been able to produce has been had by mixing in the hand until there was a fairly even distribution of the mercury, *and no longer*, and then wringing out by rolling the mass in muslin, maintaining the pressure some moments, then discarding the ends of the mass and packing carefully and evenly with a rather light, steady pressure, with as broad a point as could be conveniently used, being especially careful not to raise any free mercury to the surface. This method is so extremely difficult that I doubt its practicability for the ordinary practitioner. The method that has given the next best results has been to use a stronger pressure, and carefully remove all free mercury and softened portions of the mass as it arises. There is but little difference between this and the method of burnishing in the filling, provided the burnishing is carried out evenly and moderately. An important principle is that after mercury is mixed with the alloy and evenly distributed, *any form of violence weakens the product.* Therefore, severe burnishing makes a weak filling. Apparently for the same reason, mixing or grinding the mass in a wedgwood mortar weakens the product. Grinding in a mortar causes the alloy to take up more mercury than when mixed in the hand or in a rubber mortar, but even when given the same percentage of mercury the product will be weaker. An excess of mercury over a certain percentage (differing a little with different alloys) makes a weak mass ; but quite a wide range may be allowed without very marked difference. The most of the alloys are nearly equally good with a range of from thirty to forty-five per cent. of mercury. I had supposed that it would make no difference how the excess of mercury was removed, so that it was removed ; but I find that it does make a difference, and especially it cannot be removed while packing without weakening the product. Squeezing the mass in a vise seems to cause irregularity in results, partly because of the violence, but mostly because of the uneven removal of the mercury, the margins retaining much more than the central part of the mass. Within the range given above, the even distribution of the mercury is much more important than the amount.

Why violence weakens an amalgam can as yet be only a matter of conjecture. A theory is perhaps better than no explanation. It may be supposed that only a small proportion of the alloy is dissolved in the mercury, and this, combining with its menstruum, the mercury, forms a cementing substance which cements the particles of the alloy together. In this idea an amalgam is similar to a piece of grout-work in which the pebbles are held together by cement. Now, the more the mass is triturated, and especially the more violent the trituration, the more of the cementing substance is formed in proportion to the harder, undissolved portion of the mass, hence the greater flow. Possibly it is for this reason that alloys cut very fine, or in very thin shavings, flow more than when cut rather coarse. Alloys, when cut very fine, make a soft, pasty mass, that works smoothly and easily and flows badly. When cut coarse, they make a granular mass that is not so pasty, that does not work so smoothly, but when hard do not flow so much. Furthermore, alloys, when cut very fine, will take up more mercury under the same treatment than when cut rather coarse, but when given the same percentage of mercury, the fine-cut material will flow more than if cut rather coarse. The difference in the disposition of the fine-cut alloys to take up a greater amount of mercury is somewhat extravagantly illustrated in No. 1 of the table given below. This was not an alloy, but a mechanical mix of precipitates of the metals, almost impalpable powders. It was worked with the least mercury that seemed possible, yet the actual amount was very large.

I think it will now be seen that the above narration develops reasons for the extreme sensitiveness of the property of flowing in the silver-tin amalgams. This property is effected from so many points that it is only by the greatest delicacy in manipulation that two blocks can be made from the same mass that will flow alike.

Another phenomenon crops out occasionally through my experimentation, showing that there is still something affecting the flow that I have not yet discovered. With a given alloy, tests will go on evenly for a time, when, without any apparent reason, a single block, or possibly two, will give a much higher test than others. This has occurred oftenest when experimenting with large percentages of mercury, but it occurs also with low percentages of mercury. An example of this occurs in No. 14 of the table, hand mix, in the two blocks made with serrated point and with burnisher. I cannot explain these phenomena and am unable to repeat such results, but they cause me to think that there may be several chemical equivalents or combining quantities in which the cementing substance which holds the mass together is formed, and that occasionally one is formed that is of much firmer consistence than the more usual one. I speak of this only as one of the possibilities.

## THE TABLE.

The table presented gives the flow and crushing stress found in a series of experiments with sixteen formulæ for amalgams. The series has been made after a large experience in this work, and is regarded as the most perfect in its details of any yet made, and is chosen for presentation on that account. It is intended particularly to show the differences in flow and crushing stress due to differences in formulæ. But the differences between mortar and hand mixes, and some illustrations of the differences in modes of packing the filling, will be found. So far as I am able to judge, the formulæ are reliable. While the table is greatly condensed, the important features are given, including every experiment belonging to the series. In every case the different mixes were made from the same package of alloy.

The mercury was first weighed as closely as the fraction of a milligram. Then, without changing the weights, the scales were balanced with alloy. The mix was then made in the hand, or in the mortar, as indicated, the mass weighed, and the loss in mixing recorded. The mass was then rolled in muslin, enough being used to form a good hand-hold, and was wrung out. In case of mortar mixes, which take up more mercury than hand mixes, they were wrung with about all the power I could exert. A little lighter force was used with the hand mixes, the effort being to have the percentage of the mercury as nearly the same in the two as practicable. Several cases will be noted in which the wringing was intentionally light, to try the influence of a larger percentage of mercury. Without wringing there is one forty-per-cent. mix (No. 2), and one fifty-per-cent. mix (No. 12). After wringing, the mass was again weighed and the loss of mercury recorded.

In calculating the percentage of mercury, the loss in mixing was regarded as belonging equally to the alloy and the mercury. This loss was from half of one per cent. to about three per cent. The loss of weight by wringing was regarded as pure mercury. In all cases where the manner of packing the filling is not noted, the packing was done with a broad (for the cavity) point, taking great care to remove no mercury. The packing was strong enough, however, to make perfect blocks, all corners being filled out. Those marked as being made with broad points were in cavities 130 x 130 x 130 thousandths of an inch, and were packed with as broad an instrument as could be used, using frequently a smaller instrument in the corners so that the pressure of the large one need not be so great. If, in packing a block, mercury was freed from the mass, the block was discarded. Those marked "with burnisher" were burnished in with about the force that could be consistently used in filling teeth, and all free mercury and softened portions of the mass were carefully removed as they arose. These were also made in the large cavities. In all of these the results have been reduced to the same terms as those for the smaller blocks. This is a simple matter of proportion, the flow of a large block being slow in proportion to the increased area, or the stress may be increased in proportion to the increased area. For instance, the area of the small block is 85 x 85 = 7.225. The area of the large block is 130 x 130 = 16.900. Then the proportion gives 7.225 : 16.900 : : 60 = 140. One hundred and forty pounds stress for the larger blocks to make the flow equal that from sixty pounds for the small blocks.

It is not expected that others will be able to exactly reproduce the results given in this table, or that in another effort by myself some changes would not be made. But it is my opinion that future investigations will support the teachings of this table. Very little has been done in the investigation of the differences occurring in different melts of the same formulæ. Of five that have been tried, three have been substantially the same; one has given a better result, and one not so good. But these differences have not been great.

## EXHIBIT OF THE PHYSICAL PROPERTIES OF SILVER-TIN AMALGAMS.

| NOTES. | No. | Formulæ. | Per cent. of Mercury. | How mixed. | Days time for setting. | No. of blocks tried for flow. | Average per cent. of flow. | Pounds crushing stress. |
|---|---|---|---|---|---|---|---|---|
| A mechanical mix of precipitates of the metals. Materials furnished by Dr. Ames, of Chicago.... | 1 | Silver 60<br>Tin 40 | 55.61 | Mortar | 2 | 4 | 33.26 | 160 |
| Pressed in with serrated points, removing no mercury.... | " | " | " | " | 2 | 1 | 30.90 | |
| Burnished in.... | " | " | " | " | 2 | 1 | 35.77 | |
| | 2 | Silver 60<br>Tin 40 | 38.58 | Hand | 2 | 4 | 2.91 | 277 |
| | " | " | 41.64 | Mortar | 2 | 4 | 4.82 | 255 |
| Weighed and mixed and used without wringing out; fillings made at once | " | " | 40.00 | Hand | 2 | 2 | 5.07 | 250 |
| Fillings made after forty minutes.... | | " | " | " | 2 | 2 | 8.32 | 250 |
| Made with hot instruments after fifty minutes.... | | " | " | " | 2 | 2 | 5.82 | |
| As the blocks were made the odd numbers were placed in one box and the even numbers in another so that they should be alike, and the tests made two days apart. | 3 | Silver 42.45<br>Tin 57.55 | 40.59 | Hand | 2 | 6 | 4.89 | 230 |
| | " | " | " | " | 4 | 6 | 8.61 | 230 |
| | " | " | 39.05 | Mortar | 2 | 5 | 9.00 | 235 |
| | " | " | " | " | 4 | 5 | 9.76 | 220 |
| | 4 | Silver 55<br>Tin 40<br>Copper 5 | 32.66 | Hand | 2 | 3 | 2.44 | 315 |
| Pressed in.... | " | " | " | " | 2 | 1 | 1.89 | |
| Burnished in.... | " | " | " | " | 2 | 1 | 4.10 | |
| | 5 | Silver 53.22<br>Tin 45.88<br>Copper .45<br>Bismuth .45 | 39.08 | Hand | 3 | 4 | 7.57 | 253 |
| Pressed in.... | " | " | " | " | 3 | 1 | 5.12 | |
| Burnished in.... | " | " | " | " | 3 | 1 | 6.56 | |
| | " | " | 38.71 | Mortar | 3 | 4 | 11.75 | 257 |
| Pressed in.... | " | " | " | " | 3 | 1 | 6.72 | |
| Burnished in.... | " | " | " | " | 3 | 1 | 9.33 | |
| | 6 | Silver 48<br>Tin 48<br>Gold 4 | 31.92 | Hand | 2 | 3 | 26.55 | 210 |
| Pressed in.... | " | " | " | " | 2 | 1 | 20.49 | |
| Burnished in.... | " | " | " | " | 2 | 1 | 22.95 | |
| | " | " | 40.18 | Mortar | 2 | 3 | 30.65 | 210 |
| Pressed in.... | " | " | " | " | 2 | 1 | 31.97 | |
| Burnished in.... | " | " | " | " | 2 | 1 | 40.16 | |
| | 7 | Silver 60<br>Tin 37<br>Gold 3 | 30.31 | Hand | 2 | 3 | 25.64 | 225 |
| Pressed in.... | " | " | " | " | 2 | 1 | 22.76 | |
| Burnished in.... | " | " | " | " | 2 | 1 | 26.23 | |
| | 8 | Silver 48.5<br>Tin 48.5<br>Platinum 3.0 | 26.47 | Hand | 2 | 3 | 26.28 | 220 |
| Pressed in.... | " | " | " | " | 2 | 1 | 15.78 | |
| Burnished in.... | " | " | " | " | 2 | 1 | 28.70 | |

## EXHIBIT OF THE PHYSICAL PROPERTIES OF SILVER-TIN AMALGAMS.—*Continued.*

| NOTES. | No. | Formulæ. | Per cent. of Mercury. | How mixed. | Days time for setting. | No. of blocks tried for flow. | Average per cent. of flow. | Pounds crushing stress. |
|---|---|---|---|---|---|---|---|---|
| | 9 | Silver 44.81<br>Tin 52.78<br>Gold 1.87<br>Platinum .62 | 37.45 | Hand | 3 | 3 | 19.81 | 225 |
| Pressed in | " | " | " | " | 3 | 1 | 15.57 | |
| Burnished in | " | " | " | " | 3 | 1 | 24.59 | |
| | " | " | 36.75 | Mortar | 3 | 4 | 25.14 | 225 |
| | 10 | Silver 54.86<br>Tin 44.89<br>Zinc .25 | 41.18 | Hand | 2 | 3 | 27.59 | 237 |
| | " | " | 40.65 | Mortar | 2 | 3 | 34.91 | 227 |
| Made with hot points | " | " | " | " | 2 | 2 | 36.11 | |
| | 11 | Silver 54.86<br>Tin 44.89<br>Zinc .25<br>Palladium .25 | 40.89 | Hand | 2 | 3 | 26.92 | 250 |
| Made with hot points | " | " | " | " | 2 | 2 | 19.55 | |
| | " | " | 40.61 | Mortar | 2 | 3 | 14.96 | 260 |
| | " | " | 33.01 | Hand | 2 | 4 | 16.34 | 275 |
| | " | " | 36.29 | Mortar | 2 | 4 | 22.44 | 252 |
| | 12 | Silver 41.92<br>Tin 56.33<br>Platinum .44<br>Zinc .88<br>Bismuth .44 | 38.46 | Hand | 3 | 3 | 16.53 | 207 |
| Packed lightly, without removing any mercury | " | " | 41.43 | " | 3 | 3 | 11.33 | 195 |
| Packed heavily with small points, removing all mercury possible | " | " | " | " | 3 | 3 | 19.92 | |
| Mixed without wringing out and packed lightly without removing any mercury | " | " | 50.00 | Hand | 3 | 3 | 11.26 | 160 |
| | 13 | Silver 47.06<br>Tin 51.70<br>Copper .94<br>Zinc .24 | 41.00 | Hand | 2 | 3 | 25.09 | 235 |
| | " | " | 38.74 | Mortar | 2 | 3 | 24.48 | 237 |
| | 14 | Silver 42.83<br>Tin 51.62<br>Copper 4.65<br>Aluminum .55<br>Gold .01 | 35.95 | Hand | 2 | 3 | 14.22 | 220 |
| Pressed in | " | " | " | " | 4 | 1 | 4.09 | |
| Burnished in | " | " | " | " | 4 | 1 | 8.13 | |
| | " | " | 31.15 | Mortar | 2 | 3 | 28.44 | 200 |
| Pressed in | " | " | " | " | 4 | 1 | 16.40 | |
| Burnished in | " | " | " | " | 4 | 1 | 17.50 | |
| Experimental alloys made by Dr. P. J. Kester, of Chicago, especially for investigation | 15 | Silver 70<br>Tin 30 | 50.00 | Hand | 2 | 4 | 4.28 | 300 |
| (No mercury could be removed from these mixes by wringing through muslin.) | " | " | 50.00 | Mortar | 2 | 3 | 4.12 | 345 |
| | " | " | " | " | 5 | 3 | 5.71 | 360 |

EXHIBIT OF THE PHYSICAL PROPERTIES OF SILVER-TIN AMALGAMS.—*Continued.*

| NOTES. | No. | Formulæ. | | Per cent. of Mercury. | How mixed. | Days time for setting. | No. of blocks tried for flow. | Average per cent. of flow. | Pounds crushing stress. |
|---|---|---|---|---|---|---|---|---|---|
| (With 50 per cent. of mercury the mix was a dark, semi-coherent powder that was extremely difficult to pack.) | 16 | Silver<br>Tin | 80<br>20 | 50 | Hand | 2 | 4 | 7.41 | 275 |
| | " | " | | 50 | Mortar | 2 | 3 | 9.23 | 280 |
| (These mixes worked easily and well, only that they set very quickly.) | " | " | | 60 | Hand | 2 | 3 | 2.40 | 330 |
| | " | " | | " | " | 5 | 3 | 3.50 | 340 |
| | " | " | | 60 | Mortar | 2 | 3 | 4.24 | 315 |
| | " | " | | " | " | 5 | 3 | 4.50 | 325 |

NOTE.—In the above experimental alloys the increase of mercury required as the tin is diminished is very notable. It shows that after a certain point, not yet accurately determined, we cannot diminish the flow by diminishing the percentage of tin.

The formula of the alloy controls in large degree the flow of the amalgam formed. This is more important than the percentage of mercury or the particular mode of manipulation, provided, of course, that the percentage of mercury be reasonable and *a particular mode* of manipulation be followed. A study of the table presented will give a good idea of this.

The standard being sixty pounds for one hour on a cube 85 x 85 x 85 thousandths of an inch, or its equivalent,* a pure silver-tin alloy may be said to flow from two and a half per cent. to ten per cent., the difference depending on the composition of the alloy, the fineness of the cut, and the special mode of handling. In this statement I am supposing the range of composition to be from forty per cent. of tin to sixty per cent. of silver, to the reverse proportions. The addition of a small percentage of copper to this seems rather to diminish the flow, and gives it a greater crushing strength. No other metal has come to me in the formulæ received the addition of which does not seem to directly and markedly increase the flow of the amalgam. While these increase the flow, they do not seem to very materially injure it in its crushing strength. Indeed, the crushing strength proves to be no test of the stability of an amalgam. Its flow is the important test. Every silver-tin amalgam in the market, so far as I have seen, is, when mixed with a sufficiently low percentage of mercury, strong enough so that they will not *break* down, they will not crush. The chief difficulty is that many of them will gradually change form under the stress of mastication, as it comes upon them thrust after thrust, year after year. When subjected to heavy biting, they will finally be moved sufficiently to lose their perfect margins. This is the principal cause of that *black ditch* that is finally seen along the margins of silver-tin amalgam fillings that have been nice and perfect the first year. This does not occur along the margins of copper amalgam fillings. The copper amalgams do not flow. Experiments with them show that they hold their form perfectly under any stress short of that which crushes them. Therefore, when perfect margins are once made with copper amalgam, they remain perfect. Not so with the silver-tin amalgams. Their disposition to flow under stress allows them to be moved in the teeth of those who bite strongly, and they lose their perfect margins in consequence of this movement. It is for this reason that I attach such importance to the flow.

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* Equivalents are found by the simple rule of proportion already stated.

Among numerous observations on this point, I have this one. A family of three grown-up children required many amalgam fillings. These retained their margins perfectly during six years of observation. Another family of four coming to me at the same time had amalgam fillings also, in about the same proportion. The cases seemed about equal as to the disposition to caries. The same amalgam was used in both and with the same care, but in three of the members of the second family not a filling that was exposed to the stress of mastication retained its margins for two years. That monster of silver-tin amalgam work, the black ditch, showed itself around every one of them. The appearances indicated that the recurrence of decay was because of imperfect margins, not that decay caused the imperfect margins. These cases were an enigma to me, but when I studied them with the gnathodynamometer, I found that the children of the first family gave me a record of sixty to sixty-five pounds as the best that they could do after several trials on different days. The children of the other family gave me records of one hundred and sixty pounds and over without difficulty. Will any one doubt that the difference in the results in the fillings was due to the amalgam being sufficiently strong for those of the one family, but not sufficiently strong for the other? It is probable that most careful operators can duplicate the conditions described in their own practice.

But to return to the table. I have said that so far as I have yet seen, any metal, except copper, added to a silver-tin amalgam increases its flow. Compare formula No. 2 with formula No. 7, in which three per cent. of gold replaces an equal portion of tin, and note the difference in the flow. Compare formula No. 4 with formula No. 8, and note the difference in the flow. Compare formula No. 3 with formula No. 12, and note the difference in the flow. Study the percentages of mercury, the time given for hardening, the modes of mixing, and the special modes of putting in the fillings. This table does not represent opinions, but cold, hard experimental facts, from which opinions may be formed. If its teachings are not satisfactory, repeat the experiments carefully and conscientiously, and disprove or verify the results. It is by numerous workers that points like these are finally and definitely settled.

Again, in comparing formula No. 3 with formula No. 10, the No. 10, having the larger proportion of silver, should flow the least; but the quarter of one per cent. of zinc seems to cause it to flow the most. Wherever the zinc occurs we have the same result, wherever gold occurs the flow is increased, and so on through the list. I do not know why these things are so; I only note the facts as they stand out in my experimental work.

When so small a proportion of a given metal stands out in an experimental work of this kind, what does it say for our makers of alloys for amalgams? They have told us they used pure metals, and here is an unexpected evidence that they have done so. I must regard the results of this experimental work as something of a monument to the integrity, skill, and strict fidelity of the men who compounded the alloys. If the metals were not pure, how is it that one-fourth of one per cent. of zinc stands out in the results on flow? How is it that three per cent. of platinum stands out in the results? Go on through the list, and note the results.

It is the business of manufacturers to make what dentists want. Dentists have been calling for smooth-working alloys. They have been supplied. To this date neither dentists nor manufacturers have known of the flow of amalgams or of the effect of additions of gold, zinc, etc., upon the flow. This instability could not be avoided because it was not known.

Yet I must utter a note of warning against jumping too rapidly to conclusions. There is other important experimental work in progress, and whether or not definite use for these little additions to the silver-tin alloys may be found cannot yet be told.

Another phenomenon is beginning to take shape in this experimental work that had not been seen until recently. An example of it is seen in No. 3 of the table, particularly in the hand mix. Of this mix twelve blocks were made, and the odd numbers placed in one box and the even numbers in another. Those of the first box were tested for flow on the second day, and those of the second box on the fourth day. Those tested on the fourth day gave the greater flow. It appears that an amalgam first sets or becomes hard to a certain degree, and afterward a process of softening begins which affects the flow but not the crushing stress. Coincident with this, in several cases at least in which careful observations and comparisons have been made, an expansion of the mass has occurred. When this ends, what may be its extent, or on what it may depend, has not yet been determined for any one of the amalgams. In the majority of cases in which I have looked for it, it has not occurred at all up to the seventh and tenth days. Yet what I have seen, when connected with the clinical observation at my command, leads me to suspect that it may be a serious matter, and one that will require months, and possibly years, of close experimental work to determine. It certainly does not occur in all of the silver-tin amalgams, and is probably controlled by the constituents of the mix; that is, the whole formula, including the mercury. In my experimental work thus far, the proportion of mercury—between thirty and forty-five per cent.—has not seemed to have a very important influence on the flow of the mass, and some of the alloys will flow nearly the same with thirty per cent. as with fifty per cent. But this flow has generally been taken at from two to four days after the mass was made. What the effect of the proportion of mercury may be after the primary setting is unknown. The flow of an amalgam bears no fixed relation to the crushing stress, and nothing can be told of what it may be by crushing the mass. If it should be found that the cementing substance which is formed by a solution of a portion of the alloy in the mercury is a definite chemical compound formed by combining equivalents, and that these equivalents are gradually changed after the first setting of the mass, this depending on the formula of the alloy and the percentage of mercury, the question becomes so complicated that there is little hope for a speedy solution of it. At best it will require too much time for me to expect to be able to give a solution of it in this series of papers.

This expansion occurring as a secondary change and slowly progressing, seems to explain certain clinical phenomena that have been very perplexing. I allude particularly to fillings in the buccal surfaces of the upper molars, in a position in which no stress can come upon them in mastication. Some of these fillings become over full, apparently, after having been dressed evenly with the margins of the cavity. I can readily understand how a filling that is subjected to stress may be caused to present uneven margins by slow movement from the thrusts it must endure, but in many of the buccal surfaces of the upper teeth this cannot be the case. I have had a considerable number of old amalgam fillings, ranging from one to forty years old, from which I have cut blocks and tested them for flow. The most of them have shown a large percentage of flow, and none of them a very small percentage. In all of them what appears to be free mercury has appeared on the surface of the blocks when placed under a stress of fifty or sixty pounds. I do not find so much free mercury expressed from recent blocks as from the old amalgams, even though the flow may be as great. Of course, I have no data as to the amount of mercury mixed with these old amalgams, but the appearances suggest that in a rearrangement of the molecules after the first setting, some of the mercury may be thrown out of combination. This idea of the possible definite chemical form of the cementing substance formed in amalgams is not entirely new, as the literature will show.*

### SPHEROIDING OF AMALGAMS, SO CALLED.

Much has been said of the tendency of amalgams to assume the spherical form. My study of the subject leads me to the notion that this term has been derived from a misinterpretation of the phenomena seen. I have made hundreds of blocks of amalgam with sharp, square corners, using all possible proportions of mercury that would make a mass that would fairly *stand alone*, and removed them from the cavities at once, and have not in a single instance discovered a rounding of corners such as would be supposed to occur if the mass possessed a tendency to assume the form of a sphere. The corners remain sharp when the amalgam is hard,—that is, as sharp as the crystalline texture assumed by the general surface will permit. The phenomenon from which this term *spheroiding* has been mostly derived seems to be the disposition of amalgam fillings to rise up in the center in rounded form, but partly from the difficulty experienced in making amalgam fillings with perfect margins. Of this latter point I will have more to say in the presentation of the question of shrinkage.

Amalgam fillings (especially experimental fillings for the study of the behavior of amalgams) that have been dressed flat, may rise up in the center and assume a spherical form from at least two different causes. An expansion of the mass may occur, as related above,

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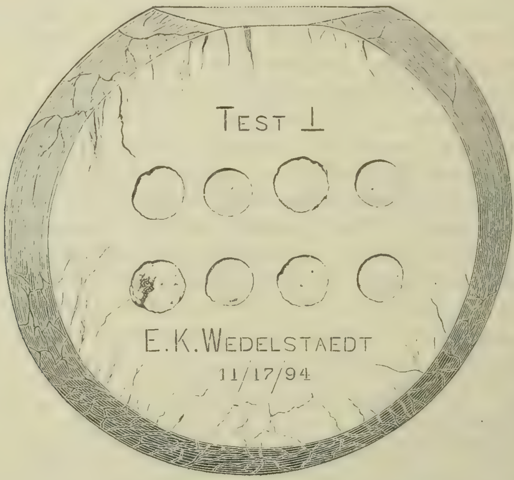
*See article by E. C. Kirk, D.D.S. "Some Principles relating to Amalgams." *International Dental Journal*, April, 1895.

and, being confined by the cavity-walls, the material will rise up in the center in the same manner as ice forming in a strong drinking-glass or other vessel will assume a spherical surface. This is because the ice flows under stress the same as the amalgam flows under stress. The two cases illustrate each other. Either, being firmly held on all sides but one, while expanding, will flow toward the point of least resistance, causing this spherical form of surface.

In Fig. 10 I present an engraving from a photograph of an ivory slab, containing eight amalgam fillings, all of which present an extravagant degree of spheroiding. The history of this slab explains many of the cases of spheroiding seen in experimental work. In the summer of 1894, Dr. E. K. Wedelstaedt, of St. Paul, Minn., sent me a slab with several amalgam fillings that had spheroided, and asked if I could account for it. The doctor had conducted a very elaborate series of experiments on the subject of the shrinkage and the leakage of amalgam fillings, and in previous trials of the amalgams used in this slab they had not presented such phenomena. Having already studied the shrinkage and expansion of dentine in varying hygrometric conditions, and knowing also of the flowing of amalgams, I began looking the matter up from the hygrometric standpoint. I learned that the fillings in question had been made by Dr. George H. Cushing, at the request of Dr. Wedelstaedt, the previous April, during a term of very damp weather, the slab having been sent him through the mail. After the amalgam had set, the fillings were dressed flat and tested for leakage, and some days later they were sent to Dr. Wedelstaedt, at St. Paul, who, after having examined them, laid them away. In reviewing his experimental work in the latter part of the summer, he found that the fillings in this particular slab had spheroided. Believing now that this had been caused by the shrinking of the ivory by the drying

Fig. 10.



A slab of ivory with eight amalgam fillings that have been squeezed far out of the cavities by the shrinkage of the ivory in drying, the fillings having been put in, allowed to harden, and then ground flat when the ivory was very damp.

out of the water that had been absorbed in the damp spring weather of Chicago, and knowing that Dr. Wedelstaedt had in his office an arrangement for holding water constantly at the temperature of ninety-eight degrees Fahr., I wrote, asking him to prepare cavities in an ivory slab and place it in the water for one week, then remove it, dry the cavities as in filling teeth, fill them with amalgam, return it to the water for twenty-four hours more, then remove, dress down flat, and lay it away to dry, and note the results.

The engraving is made from a photograph of this slab, and, as will be seen, the fillings have all assumed the rounded surface, and also the margins have been extruded considerably above the margins of the cavities. This experiment was repeated a number of times with the same results, every filling, no matter of what amalgam, not only spheroiding, but its margins being extruded considerably above the general surface of the ivory. Careful measurements of the ivory when removed from the water, and again after drying, showed quite a large degree of shrinkage.

These experiments show two things very plainly. First, the inevitable confusion that must arise from experiments made with amalgam fillings in ivory, or in human teeth out of the mouth, without the most rigid following of hygrometric conditions. Second, the relation of the strength of ivory, or dentine, to the strength of amalgam. Either human dentine or ivory from the tusk of the elephant are strong enough to cause the strongest of the silver-tin amalgams to be molded into any form when a slow, steady pressure is maintained. A block cut from human dentine may be pressed into a fully hardened amalgam filling in a cavity in ivory, or in a human tooth, causing the amalgam to well up around it and over the margin of the cavity like so much wax. This will not necessarily mar the sharp corners of the dentine block nor injure the walls of the cavity; indeed, the same block of dentine can be used for a number of such experiments. In view of these facts, it will be seen that the confusion that has appeared in this class of experimentation in the past was inevitable.

It is impracticable to fully present this subject in this paper, and thus far what may seem to be the dark side of the subject has occupied our attention. The blocks used for determining the flow of amalgam are without lateral support. Fillings in cavities are supported by the walls of the cavity. It is a fact, however, that a large proportion of the amalgam fillings made are placed in cavities so prepared that the surface on which the filling rests, *the seat of the filling*, is too small to support the stress which comes on the area of surface exposed to the stress of mastication; or the seats are so rounded that the readily yielding material allows the mass to be slowly tilted from side to side, or slightly moved. In either case the perfect margin is lost and the filling becomes leaky. Most dentists seem to have supposed that amalgam fillings were the easiest fillings to anchor safely, but as a fact they are the most difficult. Cavities prepared to receive amalgam fillings should have a broad, flat seat at right angles with the direction of stress, and parallel side walls. The form of a box is the typical form for a cavity for amalgam.

(To be continued.)

# SYSTEMIC MEDICATION IN DENTAL PRACTICE.

BY WILBUR F. LITCH, M.D., D.D.S., PHILADELPHIA, PA.

(Read before the Pennsylvania State Dental Society, July 10, 1894.)

THE subject of the physiological and pathological relations of the teeth to the general organism is a broad one, and it would manifestly be impossible at this time to traverse such a field of inquiry with anything approaching adequate thoroughness. I can only allude briefly to a few of the more important pathological conditions met with in every-day practice, in which I have found active systemic medication advantageous.

First among these in interest and importance is active inflammation of the peridental membrane set up by septic infection, or by mechanical irritation from confined gases.

We have here a pathological condition, which in a majority of cases will yield readily to local measures if not too long delayed, and if intelligently applied. Among such remedial agencies may be mentioned the prompt removal of the irritating cause by mechanical or chemical means; the application of counter-irritants or vesicants, local phlebotomy, etc. Some or all of such measures are indicated in all cases of this kind, and will usually prove successful in relieving the symptoms; but there still remain a large number of cases in which local medication unaided by active systemic treatment will prove entirely inadequate to arrest the progress of the disease.

The conditions which attend a case of this kind are, at least from the standpoint of the patient, not trifling in character, for there are few inflammations not affecting a vital organ more painful, or attended by graver constitutional disturbances. It is not necessary to describe the symptoms in detail. We all know the swollen and throbbing tissues, the quickened pulse, the hypersensitive nervous system, the furred tongue, and disordered digestion; the vitiated secretions and arrested excretions; while beyond these more transient departures from the normal loom up the possibilities of such grave complications as necrosis, septicemia, and trismus, and the still graver possibility of a fatal issue.

Certainly, in view of such possibilities, no case of active peridental inflammation, especially in deeply implanted multi-rooted teeth, should be regarded as trifling; and to combat such conditions not only in their incipiency, but throughout the whole course of their development, all available resources of the healing art should be employed.

Speaking broadly, there are two classes of remedies which are available in the systemic treatment of inflammatory conditions. First, those remedies which acting through the nervous forces controlling the circulatory system diminish the force and frequency of the pulse, and lessen the blood-impact upon the inflamed area; secondly, those remedies which by stimulating the secretory and excretory organs not only divert the blood-currents from the irritated or inflamed area to the organs thus stimulated, but diminish blood-pressure by the drain established through the increased excretory outpour thus set up.

To this class belong cathartics, emetics, diuretics, and diaphoretics. Of the motor-depressant class, first mentioned, aconite and veratrum viride are the best examples ; not only do they profoundly depress the circulation, but usually they stimulate the gastro-intestinal, cutaneous, and urinary secretions in a marked degree.

Opium, too, though primarily stimulant, is ultimately depressant to the circulation, while at the same time stimulant to the perspiratory function ; so that under proper conditions, especially when combined with a relaxing agent like ipecacuanha, and aided by hot foot-baths and copious hot drinks, marked diaphoresis is one of its most usual physiological effects. The fact, too, that in addition to these properties it has the power of diminishing, or even, for a time, abolishing pain through its paralyzing influence upon the sensory nervous system, adds greatly to the advantages, direct and indirect, which follow its employment, so that it has long been regarded as the sheet anchor in the treatment of active inflammatory conditions in nearly all organs and tissues of the body, and in peridental inflammation can, as a rule, be more advantageously employed than any other agent known to the healing art.

In addition to its other advantages, opium has this quality : that in any reasonable medicinal dose it is, at least to an adult, a perfectly safe remedy to administer. This, in dental practice, makes its employment far more practicable and desirable than the administration of either aconite or veratrum viride, both of which are powerfully depressant poisons, not uniform in their action, but, in cases of intolerance, often producing marked toxic symptoms, even when given in minute doses. This is especially true of aconitine, the agent so much employed in homœopathic practice. In the extreme dilutions of that school it is doubtless safe enough, but given in physiological and not mystical quantities, its effect upon the patient should always be carefully watched throughout the whole course of its administration. This is a requirement with which, as a rule, owing to the exigencies of office practice, the dentist cannot conveniently comply.

Such extreme care is not necessary with opium. As before stated, it is, in medicinal doses, a safe remedy. It occasionally happens that patients are intolerant of the drug, but, apart from idiosyncrasies, there are few pathological conditions in which its use is not permissible when acute inflammation is present or threatened.

Opium is indicated not only in the early stages of a formative alveolar abscess as a preventive of pus-formation, but when prevention fails, the patient should, with an occasional saline cathartic to correct its constipating tendency, be kept well under its influence throughout the entire evolution of the suppurative process until the final discharge of the pus into the oral cavity. By this treatment the inflammatory action will be circumscribed and the danger of its extension to associated tissue, such as the maxillary periosteum, greatly lessened, and—a point of prime importance—pain will be reduced to the minimum. This is sound practice, based upon well-recognized therapeutic principles and fully sustained by clinical experience.

The alkaloidal derivatives from cinchona bark, especially quinina, are also much used in the treatment of inflammatory conditions. Quinina, among its other physiological effects, reduces the circulation and lowers the temperature. In large doses it is found to check the migratory movements of the white blood-corpuscles through the walls of congested capillaries, and thus to limit or prevent pus-formation. Whether this is practically as well as theoretically true is, perhaps, an open question ; but, while not possessing the active properties of opium, it is certainly a valuable ally in the treatment of inflammatory conditions, especially when these are associated with the malarial cachexia ; and in peridental inflammation it may be freely administered in ordinary medicinal doses, and often with decided advantage.

Of the antipyretic group, consisting mainly of the coal-tar derivations, of which modern organic chemistry is now so prolific, I cannot speak with much commendation. Antipyrin, antifebrin, antikamnia, quinoline, salol, phenacetine, and a host of others, while doubtless possessing a certain degree of efficacy, are as yet too imperfectly understood to warrant any but the most tentative and discriminating experimentation. They reduce temperature, and some of them relieve pain ; but the exact manner of their action is obscure, and their administration is not infrequently followed by marked cardiac depression which sometimes ends in collapse.

The subject of the systemic treatment of those diseases of the teeth depending upon constitutional disorders for their causative agency, brings us to a wide, but as yet somewhat obscure, field of investigation. That nearly all dental disorders, not strictly mechanical in origin, if traced back to their initial impulse, to the cause of the cause, are constitutional in character is unquestionable. Even dental caries, that *fons et origo* of so many other ills, cannot be excepted. Acid-generating organisms around the teeth are potent for harm only when those organs are weak or imperfect in structure through the faulty operation of those systemic processes which are necessary to their perfect development and continued well-being. The caries fungus must, for the development of its full activity, find also favoring conditions in the existence of those vitiated secretions which are among the results of digestion and assimilation imperfectly performed.

Certainly dental caries cannot be scientifically, or even intelligently, treated when the systemic influences controlling its manifestations are not recognized, and faulty conditions rectified if possible. Much yet remains to be done in preventive dentistry as well as in the broader field of preventive medicine.

Our patch-work plugs are simply repairs of a mischief, which, in a vast majority of cases, it is perfectly possible to almost entirely prevent by a strict observance of now well-established hygienic laws, enforced from earliest childhood. Given a life so regulated, and, as a rule, the teeth, even though structurally weak, will not further degenerate, but rather strengthen with the progress of time. In defective calcification, the possibilities of improvement lie not in the direction of a substitution for nature's products and processes, but of a restoration of her tissue-building powers. I have small faith in the efficacy of chemical preparations of lime, or lime phosphates, administered in whatever quantity or combination, when the powers of digestion and assimilation are too feeble, or too perverted, to properly elaborate those already present, and abundantly present, in all healthful articles of food. I do not deny the possibility that such artificial restorative agencies may, in some obscure and indirect fashion, prove nutritive and helpful, but clinical experience has certainly made me very skeptical in regard to their general efficacy. The true cure goes back to ultimate causes; it arrests vicious dietetic habits, and brings errant functional activities once more under the guidance and dominion of natural law, obedience to which is health, and violation of which is disease and molecular or somatic death.

Calcareous deposits around the teeth constitute another prolific source of mischief. These deposits are usually local in their origin, and are liable to occur in the healthiest organisms; but that in many cases of phagedenic pericementitis the symptoms are but local manifestations of a strictly systemic disorder, is, I think, unquestionable. The subject of the gouty nature of many of these cases has of late excited great attention. Not only does their clinical history fully sustain the position that they are gouty in character, but analyses made by Professors Peirce, Brubaker, Kirk, and Congdon show conclusively the presence of calcium and sodium urates in the deposits themselves. Personally, I have long recognized the gouty character of this class of cases, the diagnosis being based entirely upon clinical evidence unsustained by those strongly corroborative analyses of the deposits themselves which Professor Peirce was the first to institute and publish.

As regards treatment, it is evident that merely local measures, however valuable and necessary, can hardly be expected to effect a permanent cure. The source of the trouble being in the blood, only such systemic measures as will result in correction of its abnormal condition will prove effective.

At present the internal administration of various lithium compounds, such as lithium carbonate, tartrate or citrate, is the treatment most in favor. By the free administration of such agents it is thought that uric acid may be oxidized to urea, or that a lithium urate may be found which, being readily soluble, will escape from the system through the various excretory channels without that arrest and deposit in articular and muscular tissues which is so liable to occur when the less diffusible calcium or sodium urates are present in excess in the blood. In conjunction with this class of remedies, saline substances which stimulate the action of the more important excretory organs are of value, and in acute gouty or rheumatic inflammation colchicum, which in full doses is highly eliminative through its active diuretic and cathartic effects, is much employed.

All such medication will, however, prove ineffective unless conjoined with a strict dietary, for the most important factor in the causation of the disease is undoubtedly the imperfect oxidation of plasma, due either to defective digestion or assimilative power, or to the use of unhealthful foods and drinks, or to the intemperate use of those which are nutritive and healthful when employed in reasonable quantity.

In tracing the etiology of those forms of gouty deposit affecting the membranous investments of the roots of teeth, two distinctly contrasted physical types may be recognized as being liable to the disorder. Gouty troubles most frequently develop in persons of the sanguineous temperament, liberal livers and hearty feeders; active in youth, but after full maturity inclined to indolence unless duty or necessity demands exertion. Appetite and digestive powers are usually so excellent that the food-supply is in excess of the legitimate demands of the system for tissue-repair, and such of the excess as cannot be eliminated through oxidizing and excretory processes is stored up in the form of fat, the individual thus becoming bulky and often obese of person, and, through the rich and abundant blood-supply, florid in complexion.

Here we have an individual who eats much, digests well, and exercises but little. His blood is rich in carbon and nitrogen compounds, but as he will not avail himself of nature's most potent agency for promoting the oxidation and healthful elimination of such compounds, namely, active exercise, and will not reduce his food-supply until it bears a more reasonable relation to the actual needs of his system, considered as a working organism, he must suffer the penalty in many ailments, such as lithemia, saccharine diabetes, albuminuria, and others more or less dangerous and difficult of cure.

The other and opposed type which I have in mind as being subject to dental disorders of gouty origin is the person of nervous temperament, who, as the result of necessity, custom, or inclination, leads a sedentary life, often in rooms imperfectly ventilated, who eats moderately of food not too well selected, and digests and assimilates imperfectly that which is eaten. Plasma thus imperfectly prepared to take its share in tissue metabolism is, of course, difficult of oxidation, and gouty deposits may be formed. This is especially likely to occur in cases in which there is a gouty or rheumatic history in the family.

Cases of this kind can be but helped systemically by regulation ot the diet, by a gradual increase of active out-of-door exercise, and by great attention to the normal performance of the respiratory functions. With many patients, and especially with women, breathing is shallow, and the lungs but imperfectly dilated. Indeed, the tightly-fitting and rigid steel-ribbed corset so generally worn by them makes full normal breathing impossible, normal oxidizing processes being thus, of course, greatly interfered with. Such cases, which in my experience occur far more frequently with women than with men, might be classified as the gout of anemia, as the first mentioned and more common type must surely be regarded as the gout of plethora. In both cases physical inertia is an important associative condition, if it is not the chief factor in the disorders under consideration.

All muscular exertion of whatever kind is, of course, associated with, indeed dependent upon, tissue-change; but tissue and food metabolism, with the evolution of urea, carbon dioxid and water, goes on most rapidly when muscular exertion is itself active and not languid and ineffective. With a brisk walk, or any form of active work or sport which quickens the respiratory movements and the circulation, the vitiated blood, loaded with waste matter, ceases to stagnate in its capillary conduits, and is hurried rapidly to the pulmonary tract; larger volumes of oxygen are taken into solution, waste matter is oxidized,—if it be a carbon compound such as sugar, into carbon dioxid and water; if a nitrogenous compound such as uric acid, into urea; all of which products of combustion pour forth in full volume from the system, either by way of the lungs, the skin, or other excretory organs. In active exercise we have then an oxidizing agency concerning the results of which, when properly employed, there is no doubt or uncertainty. Of what other agent can the same be said?

Before closing this branch of the subject, I desire to allude to an acute form of gouty inflammation of the peridental membrane, which often occurs without appreciable calcareous deposits, and primarily without purulent discharge, and which is precisely analogous to similar inflammations in other forms of connective tissue, and usually will yield readily to the same treatment required for gout in other organs and tissues of the body.

In such cases there is a sudden access of inflammation of the root-membrane, the tooth becomes exquisitely sensitive to the touch, and often highly responsive to thermal changes through associated irritability of the pulp. These cases are often mistakenly diagnosticated as pulp-congestion with associated inflammation of the root-membrane,—a diagnosis precisely reverse of the true,—and not infrequently pulp-devitalization is advised as the only effective mode of treatment; a method which, as it is pretty certain to add to the peridental inflammation, can hardly prove curative, even though it relieves the susceptibility to heat and cold.

Pulp-devitalization would certainly never be thought of, except as a *dernier ressort*, by one who recognized the truly specific gouty character of the trouble. Here active systemic medication will prove of the highest efficacy; lithium, colchicum, salines, associated with a strict dietary, will speedily bring relief and restore the affected organ to functional usefulness.

I will refer to but one other dental disorder which is undoubtedly systemic in origin, namely, the loosened teeth and spongy, bleeding gums of the scorbutic diathesis, a condition so difficult or impossible of cure when astringent washes or other local medication are exclusively employed. In all cases presenting these symptoms a scorbutic taint should be suspected, and measures instituted to correct its cause.

The etiology and pathology of scorbutic disorders is by no means clearly made out, but it is always pathognomonic of some perversion of nutrition, and is generally dependent upon a deficiency in the dietary of succulent vegetables or acid fruits, conjoined with unsanitary surroundings and a generally unhygienic mode of life. A diet either too exclusively nitrogenous or made up too largely of starchy food may cause it. Spongy, bleeding gums are often found with women of feeble and fickle appetite, who practically live upon bread and tea. In all such cases, whatever be the systemic cause, it must be sought for, and, if possible, eradicated by a corrected and improved dietary, by systematic exercise, and, if necessary, by systemic medication, in which the administration of vegetable acids bears an important part.

In these diseases of perverted nutrition, while much can be accomplished through the agency of systemic treatment, if carefully and intelligently conducted, the directions of the practitioner being faithfully carried out by the patient, too sanguine expectations of success must not be entertained. Nothing is easier than to get patients to take drugs; nothing more difficult than to induce them to follow a misliked regimen, or, indeed, to make any radical departure from their accustomed mode of life.

Still the old axiom that the disease once known is already half cured must be borne in mind. It is much that the cause of some of the more obscure dental disorders is becoming more clearly and definitely understood, for with greater knowledge as to causation, greater success in treatment is sure sooner or later to follow.

Any science or any art which is not advancing is retrograding. Dentistry cannot stand still. Logically her growth as a science which seeks for causes as well as for cure, which strives to prevent as well as to remedy diseases, must carry her into the broader field of stomatology, using that term in the widest sense, as embracing not simply the pathology of the oral cavity, but the physiology of the entire digestive process, in so far, at least, as it is concerned in those perversions of nutrition which are associated with, or causative of, dental and oral diseases.

Upon this field of investigation, so great in interest, so vast in importance, so far-reaching in its possibilities, dentistry can most fittingly enter ; and when the trained intelligence of the large body of scientific workers now found in her ranks is once systematically directed to the careful study of the vital processes connected with nutrition and its aberrations, the result cannot be otherwise than broadening to themselves, and helpful to science and to our art.

## TRICHLORACETIC ACID.

BY J. A. STACKHOUSE, D.D.S., BUFFALO, N. Y.

(Read before the Buffalo Dental Association, November 13, 1894.)

MR. PRESIDENT AND GENTLEMEN : I have selected for my topic a very recent addition to our dental materia medica, and one that, if it continues to grow in use and its results as it has promised in the space of three months with me, can, to my thinking, be reckoned among the boons the dental healing art has acquired since the discovery of anesthetics. Whether used in the relief of a pericementitis, a general stomatitis from any cause, a foul and reeking pus-pocket, or a hypertrophied condition of the gum-tissue, it gives almost immediate good results ; and I ask, Is not this justly a boon to mankind? This, I believe, is within the scope of "Trichloracetic Acid and its Use Dentally."

Trichloracetic acid is one of a group of acids of which the United States Pharmacopœia for 1889 gives three,—the monochloracetic, the diachloracetic, and trichloracetic acids respectively. They are said to have similar properties, differing only in their proportions of chlorin. It is safe to say that the two former have no application as yet in our specialty, so that this paper confines itself to the use of the third of the group,—namely, the *trichloracetic acid*. The same volume says that its preparation was discovered by Dumas in 1838, and that it is conveniently prepared by treating chloral hydrate with three times its volume of nitric acid, and placing the whole mixture in sunlight until the red fumes have disappeared. The liquid is then distilled, and the portion coming off at 195° C. is pure trichloracetic acid.

If I am rightly informed, the credit of the dental application of this acid is due to Dr. A. W. Harlan, of Chicago, though Dr. Kirk must have experimented with it in pyorrhea and hypertrophied gum-tissue at about the same time. At all events, I first heard of it at the American Dental Association at Niagara Falls, in 1892; but, like most material we hear of or about so vaguely, the announcement concerning it evidently had in my case fallen upon barren soil, for I had not turned my knowledge of it to account until a patient came under my care some three months ago, suffering from acute gingivitis that I could not alleviate by the methods usually adopted by me in such cases. My treatment consisted in first removing all traces of foreign substance at and below the gum-margins, and treatment with tinctures of aconite and iodin daily on the gums to relieve the pain, subsequently adding acetate-of-morphia paste on pellets of cotton below the gum-margins. This, in turn, as well as the above-mentioned treatment,—*i.e.*, iodin and aconite,—gave him temporary relief only. A reaction followed in his case; his suffering was intense, and he was pitiable to behold.

He being a brother physician and friendly enough disposed toward me, I was anxious to convince him, by my care of him, that there was other than mechanical art in modern dentistry. I could not follow medical tactics by ordering a change of climate, so consigned him to a brother dentist, thinking that he would return with words of commendation for my treatment from my friend; but instead, and to my satisfaction since, a new line of treatment was opened up to me which gave him almost instant and perfect relief.

This consisted in carefully cleansing the pockets containing traces of serumal deposits, degenerating food, etc., which in the first place caused the gingivitis and a loose, swollen, and aggravated condition of the gum, with hydrogen peroxid, using this once or twice in his hypodermic syringe, carefully syringing out and disinfecting the pockets. Then drying the gums, he applied a saturated solution of trichloracetic acid to the swollen gums, as well as pockets, dipping down as deeply as was comfortable to bear. This was sufficient. Relief came almost as if by magic, said the patient.

The gums were further treated likewise,—that is, the pockets were cleansed with peroxid of hydrogen daily for a few days, and carefully cauterized with the acid. All soreness left after the first application. The patient has been irregular and indifferent in following up the treatment as prescribed for him with a view to complete recovery; but I am sure there is a positive improvement.

This trichloracetic acid is, according to circumstances, a powerful escharotic, astringent, stimulant, and refrigerant. It cauterizes almost instantly, and destroys either epidermis or mucous-membrane surfaces, and in its action it does not provoke general inflammation.

If the part where it is applied be kept dry and free from saliva, the application is localized to the part thus applied. Some slight pain is attendant, and at once the circumscribed area turns to a bluish white. In about twelve hours afterward a layer, depending much upon the percentage strength of solution and quantity applied, "sloughs off," leaving a granulated surface which readily heals, and here its astringent energies assert themselves. In a few days the erstwhile sore, inflamed, and suppurating pockets, surrounded by loose and flabby gums, are transformed into a healthy ripple of mucous membrane encircling and hugging closely the periphery of the tooth.

Dr. Van Woert* associates trichloracetic acid with pyrozone. These are perhaps inseparable in the treatment of pyorrhea alveolaris, since before using the acid upon the soft tissues or gum festoon it is necessary to have the periphery of the tooth below the *gingival margin* thoroughly aseptic. But it is not my intention to go beyond the mention of pyrozone in such treatment, adhering strictly to the subject of the essay.

Dr. Van Woert mentions a practical case. A lady patient, thirty-five years old, who had been under his treatment for pyorrhea one and one-half years, showed no noticeable improvement at the end of that time, while under pyrozone and trichloracetic acid a genuine improvement was evident after two treatments, or in two weeks' time. At the end of ten days, he says, "I had the satisfaction of finding a perfectly healthy and normal condition; not the least sign of pus, and apparently perfect union between the soft tissues and the periphery of the tooth at the gingival margin."

Dr. Peirce adds his testimony, and says regarding it that it has become a specific in the treatment of dental pyorrhea, or Riggs's disease, and hypertrophied gum-tissue, especially that form seen so frequently over the third molar, and as a solvent for serumal tartar and salivary calculus. Judging from this, then, this medicament must be indispensable to him. He recommends the use of a saturated solution with great care in pathological conditions of the soft tissues, and a ten per cent. solution for removal of foreign substances from the teeth.

I might cite two or three cases of my own that may be of interest to those of us who have not yet used this treatment. The first, a lady, thirty-seven years old, although she had nearly all the teeth intended by nature, suffered from that condition so often met with in patients between the ages of thirty-five and fifty years, of sponginess of gums and irritation, caused by a ring of tartar very closely adherent to the tooth-structure, just below the margin of the gum on each tooth, with a decided suppurating pocket palatally on the superior left incisor, one each on the superior right second bicuspid, first molar of the opposite side; teeth inclined to more than ordinary looseness, and generally unclean and in an unkept condition.

After the free use of chisels and scalers and tincture of iodin, for cleaning the coronal surfaces of all teeth (as recommended by Professor Dorr, in Garretson's "Oral Surgery"), I began the treatment of the gum-tissues, cleansing with peroxid of hydrogen in my hypodermic syringe, passing the needle "gently" as far under the gums as possible without causing soreness to the patient, repeating this two or three times in as many days, so as to have the surroundings in the desired aseptic condition. I then used trichloracetic acid on cotton, twisted on a root-canal cleanser, made of piano-wire, using it as before in the pockets and gum-margins, taking one-half of either arch each time, the treatment thus taking about three weeks' time.

I am gratified to say her teeth, after being repaired by fillings, etc., are in a perfectly healthy and normal condition, as solid and clean as I believe it is possible to make them.

Another case, a gentleman, aged seventy-two, full lower natural denture, with six superior anterior teeth. The superior left cuspid root was partly denuded of gum and covered with serumal tartar, again closely adherent to the tooth ; the gum was congested, and pus was being exuded from its labial and distal surfaces (the palatal surface being healthy and free from any abnormal condition). After removing all tartar, I proceeded as above, with peroxid of hydrogen, until I got the flow of pus under control. This took me three weeks, for the breaking-down process was very persistent ; then upon the same probe I made two applications of the acid inside of a week, and in a few days the arched festoon of gum surrounding the cuspid was found to be healthy and normal.

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*Dental Cosmos, 1893, page 309.

Another case, that of a young man, aged thirty-two, who contracted syphilis five years ago. He had full upper and lower natural dentures, with exception of the superior left first molar, which I extracted two years ago on account of its looseness and the suppurative process that was taking place around it. The dental expression of his specific disorder was an exudation of pus from every tooth in both jaws and from all surfaces. I have had him under peroxid-of-hydrogen treatment for six weeks. Finding that I was making marked headway, inasmuch as the pyorrheal condition had disappeared from the majority of the teeth, on the remaining five or six I tried the acid, thinking that if I gently cauterized those suppurating surfaces a healthy granulation would follow. At this writing these teeth are not in as good condition as the rest. This is a severe and persistent case, but I am of the opinion that in time, say three or four weeks more, these remaining offenders will be in line with the majority.

Two years ago, Dr. J. H. Stackhouse and myself treated the teeth of this patient similarly, except that we used listerine and peroxid of hydrogen alternately, with the result that we got about the same condition as now exists. Those same five or six teeth resisted treatment, and we at last gave them up in despair. A question here comes up pertinently, Can the "dental expression only" of this disease be entirely cured by treatment locally applied?

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# BEADED OR GROOVED VULCANITE DENTURES.

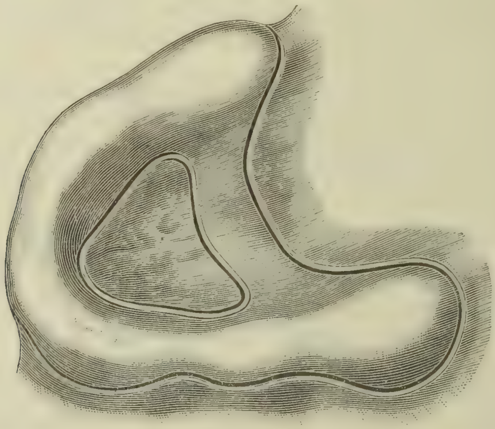
BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

In the year 1860, while associated in Cincinnati with Dr. William M. Hunter, the inventor of practical continuous-gum work, we were accustomed to pure-gold-solder a thin platinum wire along the inner border of the cut-out vacuum-chamber, to prevent its sharp edge from irritating the soft tissues and rugæ of the vault.

There was the additional advantage of a more complete exclusion of air and moisture by reason of the non-irritating imbedding of the smooth round or half-round wire in the tissues. It was doubtless the success of this device which led me subsequently to imitate it in vulcanite work by scraping a groove in the plaster model,—as in Fig. 1,—so that the vulcanized denture should have an integral half-round smooth bead formed on its vault aspect, as in Fig. 2.

There followed a further application of the device by scraping a groove across the palatal portion of the plaster model and along the buccal and labial lines of muscle attachments, to form a bead-inclosure which should produce a supplemental chamber-like function of nearly the entire inner surface of the denture (see Figs. 1 and 2). The resulting greatly increased retaining hold of the plate on the gums, especially noticeable in cases having flat and soft surfaces, is a surprisingly gratifying effect of the device.

FIG. 1.



Partial dentures like Fig. 3 may thus be securely retained, and the simplicity of the process is hardly less remarkable than the successful result. It is only essential that the scraper shall be shaped and operated to produce a suitably smooth, narrow, half-round groove in the model, and follow previously studied lines along the palatal soft parts and at the merging of the muscles in the gums. The inclosures may be of any size or shape or number that a careful pre-observation of the character and conformation of the mouth may indicate. If experience proves that the beading is too prominent at any point, ready relief may be obtained by smoothly reducing the projection at

FIG. 2.

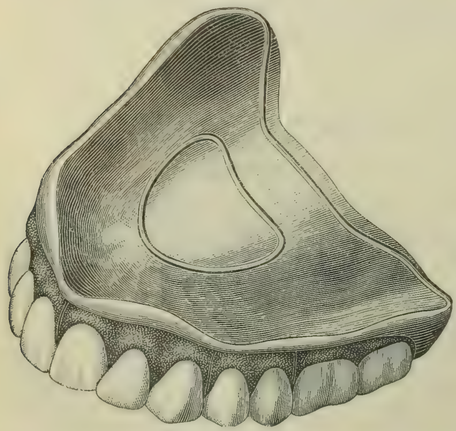
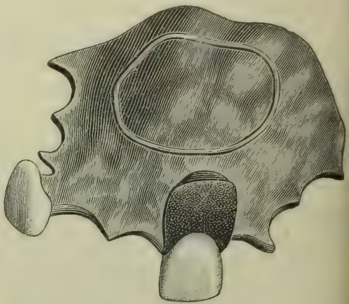


FIG. 3.

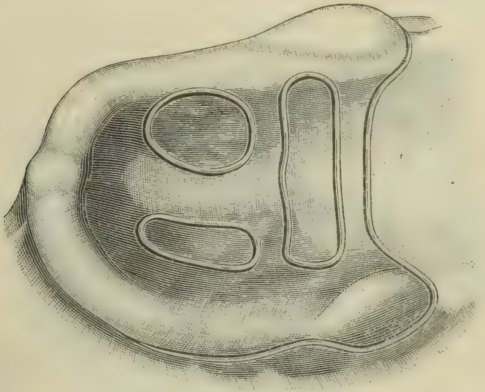


that point; but first allow time for the settling of the denture before taking off portions of the bead. In most cases, no "chamber" will be required other than the beaded inclosure, and this is a matter of considerable importance when a shallow vault and short teeth make a thin plate necessary for the proper production of speech.

In some instances, an alternative cutting of grooves in the vulcanized plate may be indicated, and that can readily be done with a round or oval engine bur, taking great care to smooth the edges of the grooves. These are especially effective in lower dentures, which may thus be given a really adhesive hold in cases otherwise most difficult of retention. When grooves are employed, strict cleanliness must be earnestly enjoined, else the foul grooves will become a source of irritation, a defect not incident to properly formed beads.

An example of duplicate and triplicate bead-inclosures is shown in the plaster model, Fig. 4, which exhibits a shallow vault having a hard anterior center with depressions on either side of the hard center. The bead lines follow the soft borders of those depressions. A further reinforcement of the retaining function is effected by a posterior bead-inclosure just within the junction of the soft with the hard palate, as previously shown. The denture thus constructed will be found to be very securely retained.

FIG. 4.



If for any reason a "chamber" is deemed desirable, it can easily be made, after vulcanization, by deepening the bead-inclosure with an engine bur.

In some instances, combined beads and grooves may be employed, and in any case obvious advantages will be found to follow the adoption of the previously described methods and devices.

## REGULATING TEETH, SUPPLEMENTED BY CROWN-WORK, TO CURE DYSPEPSIA.

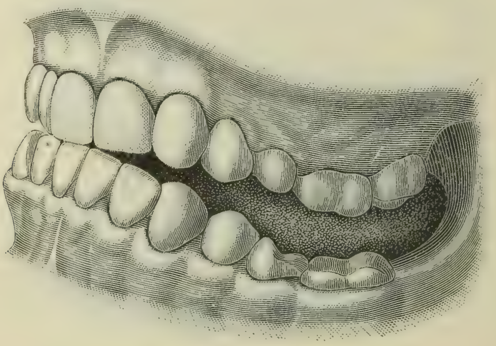
BY F. M. WILLIS, D.D.S., AUGUSTA, GA.

A YOUNG lady, about sixteen years of age, presented herself with the following history: Several years ago she had the left lateral incisor and right first bicuspid of the upper jaw extracted by a country dentist, to correct a slight irregularity. The result was that instead of remedying the condition, there was a general settling in of the entire upper jaw, resulting in a much worse condition than the first. The right superior central incisor was the only one of the upper teeth that touched the lower. There was a space of a quarter of an inch between the upper and lower bicuspids and molars when her jaws were brought together. (See Fig. 1.)

The patient was unable to masticate her food properly, and as a natural consequence she was suffering from indigestion so badly that she was unable to attend school, and her system was very much run down.

A split-plate, with a piano-wire spring, was made to spread the upper bicuspids and molars. The patient wore this appliance for six weeks, calling once a week to have the spring opened as the case progressed. The upper molars and bicuspids were now directly over the corresponding teeth of the lower jaw, having been spread about a quarter of an inch.

Fig. 1.

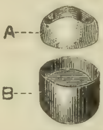


The cuspids occupied about the right position, so the next step was to move forward the centrals and lateral incisor. A gold band was fitted around the right central, with a spud resting behind the other central and the lateral incisor. The left central and the lateral incisor were somewhat twisted on their axes, so the spuds resting behind them were bent so as to twist these teeth as they moved forward. A plate was made, covering the molars and bicuspids, with a piano-wire spring resting in a notch in the gold band behind the right central. This appliance was worn for a month. The incisors were now straight on their axes, and were far enough forward to allow them to shut outside the lower teeth. Now when her jaws were closed, there was less than one-sixteenth of an inch space between the bicuspids and molars of the upper and lower jaws.

The lower molars and bicuspids were badly broken down from decay, some of them having been filled half a dozen times. To put them in good condition and raise their grinding-surfaces to articulate with the upper teeth, it was decided to crown them with gold. The molars and second bicuspids were capped in the usual way with gold crowns.

In order to avoid too much show of gold on the first bicuspids, a new method was resorted to in crowning them. A gold band was fitted around the tooth, extending about a sixteenth of an inch above the end of the tooth. An impression and bite were taken at the same time by covering the tooth and band with plaster and closing the jaws while the plaster was soft. The band and plaster were removed intact, and Melotte's fusible metal poured into the band and a pin stuck into the metal to hold in the plaster. The crown was placed on the articulator, and the bite completed with Melotte's metal and plaster. The plaster was now removed from the band, leaving a metallic surface one-sixteenth of an inch below the top of the band, against which to fit a porcelain top for the crown. In this case an ordinary plain tooth, such as is used in vulcanite work, was selected and ground to fit into the gold band and the right length to articulate with the upper teeth. This porcelain tip was cemented into the gold band, and the whole removed from the articulator. The fusible metal was heated a little, and readily came away from the crown. Fig. 2 represents the finished crown.

FIG. 2.



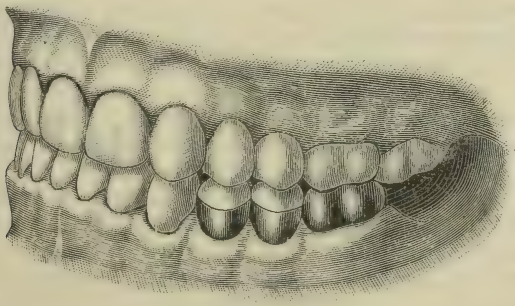
A, porcelain tip
B, gold band.

These crowns were cemented on in the mouth and produced a nice appearance, as nothing but the porcelain showed when the mouth was opened, the lip and tongue entirely hiding the gold band. A crown of this description is particularly advantageous for the lower molars and bicuspids, especially where they need to be brought up some distance above the natural tooth.

Such a crown can be made, with absolute accuracy, in one hour, and there is no risk of a fractured porcelain, as no heat is used.

Fig. 3 represents the case completed.

FIG. 3.



A very small retaining-plate is worn to hold the upper teeth in position.

None of the appliances used in this case caused the patient any pain or great inconvenience. She can now masticate as well as any one, and is enjoying better health than for years previously. I think that the young lady's life will be prolonged as a result of this operation.

# PROCEEDINGS OF SOCIETIES.

## AMERICAN MEDICAL ASSOCIATION—SECTION ON ORAL AND DENTAL SURGERY.

THE forty-sixth annual session of the American Medical Association was held in Music Hall, Baltimore, commencing Tuesday, May 7, 1895.

The section on Oral and Dental Surgery was called to order at 3 o'clock P.M. by Dr. M. H. Fletcher, of Cincinnati, chairman of the section. On motion of the secretary, Dr. E. S. Talbot, the section adjourned to meet Wednesday morning at 9 o'clock. The reason given for this action was the desire of a number of the members to listen to important papers which were read in other sections on this first afternoon.

### SECOND DAY—*Morning Session.*

The section was called to order by the chairman, who read the following address:

It is a fact that all the professions which have *man himself* for their subject, which aim to rectify his physical deficiencies, are to-day, and always have been of the greatest interest; their scientific advancement in the past decade is more marked than in any previous one, but our lack of knowledge is still very great.

Through the kindness of nature in maintaining her laws regardless of all our theories and methods, our patients recover and are even grateful, believing the result to be in exact accord with the laws which we are supposed to understand; but, though we may have been both honest and conscientious in our work, does this lessen our responsibility? In other words should we not, and can we not know better than we do? And do we take all the means accessible to inform ourselves?

When we work or reason from wrong principles, nature keeps coming back at us with the same conditions, and, by continuous knocking at our obtuseness, tries to show us the right way; and when at last we perceive and accept her teachings, we become, through our enlightenment, the true benefactors of mankind; and I take it that there is no nobler nor happier position in which a man may find himself.

Now, in order that we may attain this desirable position, our minds must be constantly on the alert, willing to correct errors, and sensitive to new truths, much as the photographer's plate is sensitive to light. This might seem a dry and monotonous pastime, but those who have tried it longest have gained the most pleasure from life, and have been of greatest usefulness.

Lubbock says, "Those who have *not* tried for themselves can hardly imagine how much science adds to the interest and variety of life." This kind of life and work gives us all the poetry we may desire, with a limitless field for imagination. It gives us art, for nature is art; it gives us history, for facts about people and nations is history; it gives us science, for knowledge of the laws of the universe is science: nor is this the limit, for after all our seeking there yet remain truths that are beyond the mind of man to conceive.

I am aware that when I touch upon the best methods of educating students for our profession, I run the risk of being prosy and tiresome; but the subject bears so directly on our standing in the future, that I presume upon your courtesy to the chair, and take advantage of my opportunity. Discussion of this point has not been confined to *our* specialty alone. Educators in almost every line have been much agitated over the same problem.

I am persuaded from what I have read and observed on this topic, that a good way to try to solve the question is through the study of mental philosophy, the laws of which, within certain limits, are as unchangeable as those pertaining to the physical man. Now if we take into consideration the fact that it is through *sense perception* that we receive all our knowledge, would it not seem that the "technic classes," or "laboratory methods," would be the most natural channel through which to educate not only *our* students, but those in all branches of medicine? Recall, for instance, the delicate technique required of the successful surgeon, the oculist, the throat specialist, or gynecologist; even the general practitioner needs a gentle and educated touch, and a most thoroughly trained mind in reasoning from cause to effect, and effect to cause. Good and accurate results come only to him who has learned how to reason after this manner; first on the simplest matters in philosophy, then gradually going on, step by step, until he is able to handle in a practical way the more abstruse problems. This training begins in babyhood, from the time the infant first notices the candle-light, and by experiment learns that if he touches it he suffers pain. Thus he accumulates one fact after another, until he finally reaches the last stages of mental development, that of judgment and ideation. In our own division one needs to be somewhat proficient in at least four callings, namely, as an artist, a scholar, a scientist, and a philosopher. If one of fair ability honestly endeavors to meet the demands of his profession in these four callings, all things desirable will be at his command.

It must be evident that, it matters not whether a student be dull or precocious, the amount of his knowledge is proportional to his accumulation of facts and his ability to recall and utilize them.

Different men have different abilities. Some persons do with great ease or almost intuitively those things that are only done with the greatest effort by others, if they succeed at all. This being the case, the standard of license to practice any department of medicine should be so guarded that no incompetent person could enter its ranks. As to the best methods of educating for this standard, the most natural, as before stated, is that method in which the senses convey knowledge by contact with the objects and phenomena in actual work, first in its simplest form, then gradually leading, step by step, to perfection; by this method the mind is stored with facts, and trained to reason about and use them to the end desired.

The "technic system" of teaching was very ably presented last May by Dr. Edward C. Kirk, before the Academy of Dental Science of Boston, and well discussed by its members, and I wish to say that I heartily agree with the essayist. There is, however, one feature of education in both dental and medical colleges which was only touched upon in the paper and mentioned by no one during its discussion, yet I consider it a question of the greatest importance. It is that of *having suitably trained instructors in our colleges*. This need I deem to be as great a defect as any, at the present time, in our system of teaching.

At the last meeting of the American Dental Association, during the discussion of the report of the Committee on Dental Education, Dr. H. J. McKellops struck the keynote when he said, "Give me the man who can teach science." If a student is bright and apt in his college work, he will make good progress under almost any circumstances; but if he makes good progress with poor instruction, how much better would he do under thoroughly trained teachers. It has been my pleasure to be a student *under instruction* in some branch almost continuously for the past eighteen years, and this feature of ability, or lack of it, to impart knowledge is a point that has impressed me very strongly, with every change of subject and instructor. It is not every one that has knowledge who knows how to impart it intelligently, and the *fewer* number know how to present a subject in a form most suited to the mental status of their hearers.

If the capabilities of all students were equal, and their interest in progress were the same, the matter would not present so many difficulties to the instructor; but were these conditions possible, the same class would progress much more rapidly under one teacher than under another. An article in a recent magazine, by a college student, compares two professors in the following manner. He says of one, "Though he thoroughly knows his subject, his instruction is about as clear as mud; with him everything is 'perfectly obvious,' but to us his attempts at exposition are positively confusing; he thinks only of his subject, never of his students; he is cold, unsympathetic, unapproachable. I want to know the nature of this requirement for to-morrow, but if I ask him, he will either show impatience at my ignorance or temerity, or misconstrue the motive of my inquiry and stand upon his pedestal of superior knowledge. But with Professor X we make headway; he seems anxious and able to make everything clear; he puts himself in his pupil's place; he is always willing to remain after the lecture to answer questions or discuss debatable points."

Charles C. Ramsay, in the January number of *The Educational Review*, speaks of this subject as follows: "True teaching, whether in school or college, is the process of 'causing another to know,' through self-activity, and 'includes the mutual effort of two persons to the same end,' the teacher and the learner. 'Until the two are at this common work, the process of teaching has not begun; until the learner has learned, the teacher has not taught.' And let it be remembered that the proof of the teaching process always rests with the learner, not with the teacher, whether the scholars be young or old. The teacher can prove that he tried to teach, the scholar alone can show that the teacher succeeded. 'The measure of information,' said Pestalozzi, 'is not what the teacher can give, but what the pupil can receive.' These fundamental principles of all good teaching are as applicable to collegiate as to elementary and secondary instruction."

Now, if this be the case in literary institutions and universities, where the professors and teachers give their entire time to this work, and should know how to do it in the best possible manner, how much more is it true in dental and medical colleges, where the teaching is done by men whose time is almost wholly taken up with a busy practice; many of them eminent and skilled in their professional duties, yet quite as marked for their lack of ability to teach. Nevertheless, their students are expected to reach a high standard under their tutorage. Is it any wonder, then, that students pony, and resort to all kinds of methods for getting assistance at examinations under such conditions?

The subject as to whether the lecture method or that of recitation is best has been pretty fully discussed among our educators, but whichever method is adopted in no way makes a good or bad teacher.

Now, if one needs so much training in order to properly fill a simple cavity or extract a tooth, a procedure which seems so simple to us, how much greater his obligation to be properly prepared before attempting to direct and instruct the intellect of others. The loss of teeth or a limb may be replaced by artificial substitutes, but the loss of time can never be replaced; and time to many students is as valuable as to the professor,—probably not from an immediate financial standpoint, but the loss of time to an earnest, intelligent student at an age when he is studying a profession is *not* a trivial matter. You may say that many students, or even most of them, care but little for their time, or what they learn, so they are graduated and given a license to practice. Granting this to be true, it is all the greater reflection upon their instructors; for if the work was made more interesting, the number of attentive students would increase proportionally, and develop into the kind of practitioner we delight to recognize. It is a known fact that it is not always the pupils who stand the highest in a class that show the best results in after-life. The plodding, honest ones in almost every class many times outnumber the precocious ones, and under the guidance of properly trained and intelligent instructors the number of honest plodders might be increased from the ranks of those who are apparently dull and careless, and the list of precocious might be enlarged from those who are brilliant and capable, but who fritter away their time in gayety and foolishness. It is not an uncommon thing to find in a class students who outrank many of their professors in strength of intellect and natural ability. Not only these, but all students have a right to demand that their instruction be presented to them in the best possible manner.

It is a perfectly easy matter to get professors for the asking, but trained teachers are rare, and even those who have the natural qualities to become good instructors are not numerous. No one doubts that we have professors in almost every college who are thoroughly capable, and who take time and pains to be what they should to the student; but, on the other hand, a greater number fall far short of this standard.

I believe a majority of students in all colleges are industrious and of good intent, and many of them are barely able financially to carry through a three or four years' course. Such students, if denied the full measure of their capacities to receive, are defrauded of both money and time, the first of which never is, and the last never can be, repaid.

There are no normal schools, so far as I know, for the proper training of dental and medical teachers, and if there were, it does not seem practicable for many of our eminent practitioners—who are in other respects most suited for the position of instructors—to leave work and go to other localities for such training; but such a normal school, it seems to me, is demanded in some suitable form, and it would seem a most fitting topic for discussion and action by our national associations of faculties.

The distance a missile flies and the velocity with which it goes is exactly proportional to the force which impels it. The analogy holds good in our colleges, for students of high grade cannot be graduated unless the force can be found in his Alma Mater to produce the desired result. Consequently, it would seem no more necessary, if as much, to lengthen the term at college, increase the curriculum, and raise the standard of entrance, than it is to increase the quality and ability of college instructors.

### *Discussion.*

Dr. W. X. SUDDUTH appreciated thoroughly the facts set out in the paper as to the difficulty of finding men to fill the chairs in professional schools who have the peculiar aptness for imparting knowledge that the best interests of the schools demand. This aptness is much rarer than the mere possession of knowledge itself or professional skill. This criticism applies to all professional schools, and the idea advanced by Dr. Fletcher of a normal school for the training of professional teachers is a good one if it could be carried out. The advantages are frequently seen in the teachers of large graded schools who have had normal-school advantages. They have the trained faculties of a metaphysician, and easily adapt their instructions to the various needs and peculiarities of pupils, instructing them in the way best fitted to their understandings. In the medical, dental, and other professional schools the professors are chosen usually for professional eminence, for skillful and successful practice, rather than for the peculiar ability which enables one to successfully impart instruction, and the result falls far short of the ideal.

The point the chairman made in regard to technical education was a good point, and Dr. Sudduth thought that within the next decade a real advance would be made in this direction. The advanced knowledge we have of dental anatomy and articulation will make itself felt in dental prosthesis. Dr. Bonwill's work is going to be of immense benefit. It has given us a scientific basis to work on, and a thorough knowledge of his work and the use of his articulator will enable us to insert plates which will be serviceable and satisfactory, and crowns and bridge-work that will be permanent. The correct articulation of both crowns and bridges is more important than many operators imagine. When articulated properly they will stay where they are placed. It is doubtful whether we will succeed in raising the standard of education required for admission into the colleges. It may be done in some instances, but so long as the chairs are held by men with no appreciation of the necessity for higher education it will never be carried through. The controlling influence is in most cases mercenary, and it always has been. A slow progress in this direction is, however, probable. The world was not made in a day, and it is impossible to overcome the opposing interests at once. A feeling took rise with the meeting of the Ninth International Congress that dentistry is a branch of medicine, and since then the medical colleges have done much to raise the standard of dental education ; but the dental colleges have not followed. Even the best of the dental schools have been unable to keep the pace, and there is to-day a wider difference between dentistry and medicine than there was in 1887. The principal advances are in laboratory work, and this receives so much attention, every hour of which is needed, that it has become a physical impossibility for a student, even in five years, to master both medicine and dentistry. He thought the smaller schools were better than the larger ones in what they did for the students, on account of the closer personal relation between the students and the professors. A larger proportion of the students in the smaller schools will be found to take the degree in medicine. It would be better to limit the number of students.

Dr. WM. A. MILLS, of Baltimore, agreed with the paper that the instructor will attain the highest success in exact proportion as he puts himself in the place of his students, and gets the student in close sympathy with him. The higher education, so much talked of, will never be reached till the profession is rid of a class of old practitioners who are proud of themselves as self-made dentists and their ignorance of medical matters. We must learn that a knowledge of anatomy, physiology, and bacteriology is necessary to a good dentist. The time will come when the younger men will step to the front and raise the standard.

Dr. GEORGE F. EAMES, of Boston, was in full sympathy with the thought that unless a student has learned, he has not been taught. Also with the idea that the professor influences the student better by closely associating with the student, though he knew there was a feeling among many in the profession that a professor should hold himself aloof from and above the student.

Dr. R. R. ANDREWS, of Cambridge, Mass., said the practice at the dental school of Harvard University was to take a large class and weed them out at the successive examinations, so that from a class of about seventy only about twenty would graduate. He thought all graduates should first be in medicine, and then the special education should follow.

Dr. W. G. A. BONWILL, of Philadelphia, disclaimed for himself any pretense of being either an educated or a scientific man, but he had met about as large a number of men as had any other, and had come into contact with as many dental students, perhaps, as any other man, except the college professors, and he had learned something from this contact. He was very severe on dental colleges, both for what they do and for what they leave undone. The professors do not do their duty, but leave the students too much to the teaching of the demonstrators, who are not always the best men for the work. They are frequently chosen on account of their position or on account of their appearance, and not because they are best fitted to teach. He would prefer to have fewer colleges, and pay the professors and demonstrators so they could afford to lay aside every other consideration and teach thoroughly what they know. The time usually given to the students by the professors is not enough. He thought more care should be exercised in selecting young men for students; some knowledge should be had of their antecedents, and their natural or acquired manipulative ability should be tested, and, if found deficient, they should be discouraged as unfit to become dental students.

The subject was passed and Dr. S. A. HOPKINS, of Boston, read a paper of which we give the following abstract:

## BACTERIOLOGY.

The essayist, in speaking of the advance made in the department of dentistry, referred particularly to the high degree of skill which had been attained by dentists in what might be called the manipulative phase of their work. So remarkable have been the attainments in this regard that it seems difficult to know how to go farther. In the performance of the most difficult surgical operations, no more delicate touch, no higher degree of skill can be exercised than is called forth in the daily practice of the dentist. A high plane has certainly been reached in the direction of practical operations, but there is another direction in which our mental activity has not yet had full scope. He was convinced that in the study of pathology, and especially in the study of bacteriology, there is a rich field to be cultivated, and a splendid harvest of scientific truths to be garnered.

The essayist outlined at some length the origin and growth of the study of bacterial pathology, dating the origin of work in this field as coincident with the wonderful improvements in microscopes made in the latter part of the seventeenth century by Leeuwenhoek. The next important advance was made possible by Koch's discovery of solid-culture media, which placed the work upon a scientific basis and made possible investigations that up to that time could not have been made. It was Pasteur's application of the new science in the treatment of anthrax and other diseases that made bacteriology practical as applied to the treatment of disease, and opened to the world a new method of treatment which bids fair to outshine in its usefulness and scientific accuracy all previous knowledge of curative medicine. He referred to the important and admirable work done in this field by Sir Joseph Lister, Professor Miller, of Berlin, and in our own country by the Surgeon-General of the United States Army, George M. Sternberg. Out of the combined work of bacteriological investigators has grown our knowledge of the facts that the bacteria which play so important a part in the economy of life are members of the vegetable kingdom; also that while many of them are disease-producing, it is a great error, and one which seems to have taken strong hold of the popular mind, that all bacteria are pathogenic.

It is true that many of our most fatal epidemics have been traced to these infinitesimal organisms; they, and they alone, have been proved to be the essential factor in the production of many diseases. Undoubtedly there will be many more convicted of guilt, but we should not lose sight of the fact that the great army of bacteria, so far as we know, are harmless, while many forms render most beneficent and important service to mankind. The symbiotic relationship of many of the bacteria was then alluded to. Those, for example, concerned in the fixation of atmospheric nitrogen in plants which serve as food for the maintenance of animal life; experiments having shown that land which is sterile of bacteria was incapable of supporting animal life. The function of bacteria in the natural purification of water was alluded to, as well as the useful rôle played by these organisms in the processes of fermentation in the production of bread, vinegar, wine, beer, etc. The relation of pathogenic bacteria to conditions of filth and unsanitary surroundings, as shown in the investigations of the etiology of cholera, typhoid fever, and tuberculosis, was shown, and the connection of these diseases noted. The essayist laid especial stress upon the importance of care in all dental operations for the sterilization of napkins, spittoons, instruments, etc., stating that the process cannot be too thorough, because the danger is a real one and exposure may come at any time. We cannot work on strictly antiseptic conditions, it is true, for it would be impossible to sterilize the juices of the mouth or the atmosphere of the operating room. While we can do much to render the possibility of infection from these sources as remote as possible, we are only responsible for the transmission of disease from one patient to another, and the dentist who neglects to sterilize his instruments after using them has the fearful responsibility on his conscience. The recent investigations in the pathology of diphtheria were detailed at some length, the Klebs-Loeffler bacillus having an especial interest to dentists because of its being found in the mouth and throat. The practice and method of application of the antitoxin treatment of diphtheria was explained in detail and statistics presented, showing the large reduction in mortality resulting from this method of treatment. The author reviewed at length our knowledge of the bacterial origin of caries of the teeth, referring to the brilliant researches of Miller, Vignal, Black, and others, but regarded their results as a mere beginning of the investigation, which must be pursued much farther before our knowledge of the subject is completed. It has been shown that caries is produced by a group of bacteria, whose special individual functions are yet to be worked out. The author believed the time to be near at hand when information based upon exact scientific investigation would elucidate the exact rôle played by individual types belonging to the group of micro-organisms now known to be concerned in the etiology of caries of the teeth.

The author acknowledged his obligations to G. Sims Woodhead, of Edinburgh, to Professor Sedgwick, of the Massachusetts Institute of Technology, and to Professor Ernst, of the Harvard Medical School, for many suggestions offered in his paper.

### *Discussion.*

Dr. W. X. Sudduth, of Minneapolis, spoke of the importance of a knowledge of bacteria to the health of cities, in regard to the purification of their water-supply and of the system of sand filtration. Also the immunity from disease produced by introduction of antitoxin. The system undoubtedly has the power of developing its own protection from disease, if it is not overwhelmed. He spoke of Miller's investigations and his successful proving by analysis the decay-producing bacteria.

Dr. Hopkins said he had not meant to say that decay of the teeth had not been produced artificially, but only that the particular bacteria which produced it were not identified. There are or appear to be at least five which take part in the production of caries, and the specific work of each of these different forms has not been determined.

Dr. Sudduth said that the final truth is that lactic-acid producing germs are the ones which produce caries, and the lactic acid causes the decay ; and, so far as he has heard, this is the only acid which has been proved to produce it. His study has brought him to the conclusion that the Spirilli lactici acidi which produces lactic acid is identical with bacilli found in the mouth.

Dr. Wm. A. Mills spoke of the necessity of continued research in the field of bacteriology, especially for dentists, and regretted that more of the profession did not show a desire for it.

Subject passed, and the section adjourned till 3 P.M.

### Second Day—*Afternoon Session.*

The section was called to order at 3 P.M., and Dr. Wm. A. Mills, of Baltimore, read a paper, of which an abstract follows, entitled,—

## Specific Treatment of Necrosis of the Alveoli and Maxillæ with Aromatic Sulfuric Acid.

The author described two cases of necrosis from his private practice treated by the use of aromatic sulfuric acid, as follows :

The first case, a lady, aged thirty, of nervo-bilious temperament, called for advice concerning a fistulous opening situated at the right side of the superior central incisor, from which was discharging freely a dark-colored pus. Upon examination it was found that the right central, lateral, and cuspid were dead. The patient stated that they had been so for seven years or more, and had never been treated. The case was diagnosed as necrosis superinduced by chronic abscesses. The following was prescribed :

℞—Acid. sulfuric. aromatic., ℥ ij ;
Aqua, f℥ x. M.

To be injected by the patient into the fistulous opening five or six times daily, bicarbonate soda and water to be used as an alkaline mouth-wash after each injection. Patient was instructed to report every other day for examination.

At the expiration of two weeks all discharge had ceased. The soft tissues had fallen into the cavity made by the action of the aromatic sulfuric acid upon the necrosed tissue. An incision was made extending from the fistulous opening to the right first bicuspid. The cavity was then packed with absorbent cotton saturated with the following :

℞—Acid. carbolic., C. P.,
Tinct. iodin, āā, ʒ ss ;
Aqua, f℥ xij. M.

The patient was then dismissed, to return next day, when the cotton pledget was removed. The soft tissues having been pushed aside, I was able to see to what extent the bony structures had been diseased.

I found the line of necrosis had involved the right facial surface of the superior maxilla from the left central to the right bicuspid, and upward from the alveolar ridge to the anterior nasal spine, a part of which, with the bony structure around the apices of the dead teeth, had been destroyed. Only sufficient alveolar septum remained to hold them in position. [A similar case is reported by Dr. Black in Vol. I, page 950, "American System of Dentistry."]

I opened the pulp-canals of the three dead teeth, cleaned, disinfected, and filled them at once. The filling-material was forced through the apical foramina from the posterior surface, and dressed in the usual manner. The patient was then dismissed, with instructions to syringe out the cavity twice a day with the carbolic acid and iodin wash as long as the syringe could be used. Afterward the medicament was to be used as a mouth-wash.

In five weeks new bone-tissue had filled the void, and no evidence of the part having been diseased remained, the outline being quite perfect and all the tissues in a normal condition.

Case 2. A lawyer, aged forty, of sanguo-bilious temperament, presented the following conditions : A fistulous opening situated to the right of the left inferior cuspid, another to the left of the right inferior cuspid, both openings discharging pus copiously.

This condition had continued for over a year, and the patient failing to get any relief from many doctors and many medicines, consulted a surgeon, who diagnosed his case as necrosis, caused, the surgeon said, by the toxic effect of mercury or by syphilis. That neither was the case the patient protested most vehemently. He was informed that he would have to be operated upon. The first thing the surgeon suggested was to have all the incisors extracted, in the hope that nature would have a better chance to throw off the sequestrum. The patient had no objection to having an operation performed, but did object most strenuously to having his teeth extracted, as he possessed a beautiful set, perfect in form and arrangement ; no filled or dead teeth were present in his mouth, he having taken the greatest care from boyhood to preserve them. He consulted me to find out if I could in some way manage to save his teeth. I suggested the sulfuric acid treatment, which I thought would not only save his teeth, but save him from having to undergo an operation. After consulting with the surgeon, it was agreed that I should take charge of the case, with the understanding that I was to consult with the surgeon as the treatment progressed, and not under any circumstances to change the treatment without his knowledge.

The treatment in this case was the same as in case No. 1. After the first day's treatment, the patient came to the office early in the morning with a very distressed countenance, and said he believed I had aggravated the trouble, because the flow of pus had been so great during the night he could scarcely sleep. I assured him it was a good sign, and that the remedy was doing its work well. The first week the teeth became movable and tender to the touch. A vulcanite splint plate was made to hold them in place and protect them from shock during the process of mastication. At the expiration of two weeks all discharge had ceased. Then an incision was made from the left fistulous opening to the right, and the cavity packed with absorbent cotton saturated with the carbolic acid and iodin mixture, as in the first case, and left to remain until the next day.

When the pledget of cotton was removed, the following conditions were presented. The line of necrosis was found to have involved the facial surface of the inferior maxilla from cuspid to cuspid, slightly exposing the pulps at the apices of two central incisors.

The septa were nearly destroyed ; the teeth were only held in position by their attachment to the external or posterior plate of the alveolar process and gum-tissue. The same instructions for injection and mouth-wash were given as in the former case. In six weeks the patient was pronounced cured, the teeth all living and firm, and the continuity of the maxillary outline fully restored

The advantage of this treatment in the oral cavity over that of surgical operation is, the periosteum is in no way injured, and therefore no loss of the continuity of outline of the bony structures occurs, nor is there loss of teeth through the necessary extraction required in an operation for removal of the sequestrum.

The author, in view of his success in these cases, urged the advisability of first exhausting the possibilities of the sulfuric acid treatment before surgical operative treatment for the necrosis was instituted.

## *Discussion.*

Dr. E. S. Talbot, of Chicago, had used the aromatic sulfuric acid with the same result that Dr. Mills describes. In cases where there is extensive necrosis, it is necessary to first remove the necrosed bone with instruments.

Dr. J. L. Williams, of Boston, Mass., had been surprised at times that such good results had been gotten by the extended use of aromatic sulfuric acid, without the use of instruments, for the removal of the necrosed bone. In some cases he had had to make two incisions to allow the application of the acid.

Dr. Wm. Knight, of Cincinnati, spoke of the necessity of making every possible effort to save the teeth in cases such as described. In many cases where their sacrifice appeared unavoidable, they yet could be and should be saved. Surgeons, he said, were more likely to sacrifice the teeth than dentists would be.

Dr. Joseph Roach. of Baltimore, spoke of a case which resulted from a blow of a base-ball. His treatment was by the application of acetate of zinc, and then washing the parts thoroughly with carbolated water ; the treatment extended over about two weeks, and gave favorable results. In other cases he had used sulfuric acid, but thought it was unnecessarily painful ; its affinity for water was so great that its application was too severe. Acetate of zinc gave as good results, and had not this objection.

Dr. W. S. Twilley, of Baltimore, found the use of aromatic sulfuric acid in a thirty per cent. solution satisfactory. He spoke of a case where a student, in extracting a third molar, removed not the tooth alone, but with it a piece of the process from an inch to an inch and a quarter long. The patient was brought to Dr. Twilley with the mouth in a terrible condition. He prescribed a wash of carbolized water, to be used twenty times a day, afterward treated with sulfuric acid. After a few days he found that the tissues had grown over the whole of the wounded and broken bone, and to-day there is scarcely a trace of the injury perceptible.

Dr. J. L. Williams said that the persistence in the treatment described in the paper would save teeth often which the general surgeon would probably sacrifice.

Dr. M. H. Fletcher had used the aromatic sulfuric acid in full strength in cases of necrosed bone, and also in phagedenic affections of the gums, and got better results than he had with other remedies.

Dr. Mills spoke of the fact that, in one of his cases, there were two fistulous openings; this was an advantage, as the remedy would pass into one and out of the other, thus rendering the application and action of the acid more easy and effectual. Aromatic sulfuric acid in the strength he uses it is not very strong, and he did not think cauterization would take place on its application. In this strength it acts simply as a stimulant.

The surgeon's attention should be called to the fact that they sacrifice teeth that could be saved both in cases where they operate and where they let nature take care of the cure. A case which happened in Baltimore was instanced, in which the surgeon removed the whole nasal floor and one maxilla with all the teeth on that side, sacrificing the teeth and leaving the mouth in a condition in which it was impossible for a plate to be worn.

Dr. J. Taft, of Cincinnati, spoke very strongly in condemnation of the needless extraction of teeth by dentists. It is true that the general surgeon often fails to appreciate the necessity of carefully preserving teeth. It should be impressed upon them on every occasion. He spoke of an operation he witnessed a surgeon perform,—the removal of a little epulis; the cuspid and bicuspid were both removed, and a V-shaped piece cut out extending quite to the bottom of the process, thus forming a breach which will probably make a disfigurement of the face to last as long as the patient lives, and there was no sort of excuse for it. Dentists should know the nature of such growths, and should know when and how to operate. Such operations should be considered quite in the field of dentistry.

Dr. J. L. Williams said no, not dentistry. Dentistry is concerned only with treatment of the teeth. Such operations should be called oristry.

Dr. R. R. Andrews moved that a vote of thanks be tendered to Dr. Hopkins for the paper which he read in the morning. The vote of thanks was given and the subject passed.

Dr. E. S. Talbot announced that, according to the rules of the American Medical Association, all sections are required to elect their officers for the next year at the afternoon session of the second day, and moved that they proceed to election of officers. The result of the election was: Dr. R. R. Andrews, of Cambridge, Mass., chairman; Dr. E. S. Talbot, of Chicago, secretary.

Dr. Joseph Roach, of Baltimore, read the following paper:

## Common Ground of Medicine and Dentistry.

At the outstart, definitions are necessary, and it is well to state that the term medicine includes all that the average practitioner would expect to do, who did not think of establishing himself in any one of the numberless so-called specialties of medicine.

For convenience, I will call dentistry one of these specialties, although it might be shown that it is so distinct and so peculiar as to make it well-nigh a thing by itself, and difficult to place with any of the specialties.

If it be surgery, many of its operations consist in cutting out decayed parts in an organ so constituted that it has of itself no power to make use of the *vis medicatrix naturæ* found in other organs and tissues, and with filling the same with some foreign material.

The sole use of that material is to prevent further progress of the disease, and to serve as a substitute for grinding and cutting food. There is no blood, no ligation of arteries, no stitches, no sutures are made, and the patient is dismissed on the spot, cured by a surgery of which it might be said that its only relapses are due either to mechanical imperfections in the operations or to inherent faults in the structure repaired. True it is that one department of this work touches on surgery thus far, that in the exploration of the canals occupying the roots of teeth, either by a failure to remove living tissue or a failure to disinfect any decomposed tissue, a local sepsis may occur, resulting in abscess and occasionally involving grave consequences. But even this does not ordinarily rise higher in the scale of surgery than the treatment of a phlegmon or of a felon on the finger.

I have thus purposely taken a low view of the daily work of dentistry, for this reason. I think possibly too much pains has been taken by its membership to elevate a most useful, nay, a most indispensable calling, into a position to vie with surgery proper. I say daily work, for while it is true that, as dentists, we are occasionally called upon to repair a fractured maxilla or even extirpate a tumor of the jaw, such operations are but occasional, and, in the nature of the case, seem to me to fall as naturally into the domain of the general surgeon as does the fracture of the femur. The true usefulness of the dental surgeon in such cases rests in his ability as mechanician to skillfully form and adjust special splints in case of fracture. This ability he forms from his daily work noticing artificial dentures, or in his possessing special cutting instruments in the form of burs, etc., for the dental engine, instruments peculiarly adapted for his own work in removing decay from teeth, and turned to occasional use as above in removing tumors. Still more mechanical, though none the less skillful, is the work of making plates, crowns, bridges, etc., where to the dexterity of the mechanic must be added the fine eye of the artist, restoring sunken features, harmonizing incongruities, and above all and most perplexing of all, pleasing or failing to please the tastes of fading humanity. But while all the above may be true, and the work of the average dental surgeon may be largely mechanical, the fact that both the surgeon and he work on that image of Jove, the human body, makes a bond of union between them which is worth study, inasmuch as whatever links in this bond are found to be the common property of both, are of much greater interest than any dissimilar points.

Of the maladies of common interest I will mention those often obscure and occasionally grave diseases that involve the maxillary sinus. This is obvious, for the reason that in such cases the dental surgeon very often is apt to be the first observer on the ground. For whether we view these diseases as arising from diseased teeth or from some more remote and obscure cause, the dental surgeon, if he be ready to take up such cases for himself or turn them over to the surgeon, is none the less called on to diagnose accurately the symptoms, that they may be treated as purely from tooth-trouble or he may proceed on some other line.

It is not in the province of this paper fully to describe all the various troubles that may arise in the maxillary sinus, but, if you will throw with me a rapid glance at its position and uses, it will be of service in following any line of treatment that may be suggested. It is situated above the so-called jaw-teeth on either side of the upper jaw, and extending from the first bicuspid (sometimes the cuspid) backward to the second molar of the same. Its size varies, and its exterior or facial walls are quite thin, the palatal wall stronger and its floor very variable in shape and thickness. The only opening into it upward is into the nasal cavity.

The situation of the cavity is surgically important, for when we consider the tendency of all mucous-membrane covered surfaces to catarrhal troubles, and the position of any cavity without natural drain,—shut in by bony walls, and its only outlet narrow and pointing upward,—we see at a glance how the difficulty or impossibility of any natural drainage and the tendency of fluids once accumulated could give even more trouble than does occur. Indeed, if we consider the tendency of catarrhal troubles to spread by continuity of surface, it seems a wonder that all cases of chronic nasal catarrh do not involve ingorgement of the antrum itself. Certainly this is what one might expect. Yet it would seem that this is not only not true, but that, on the other hand, certainly from the partial view of the case taken by the dental surgeon, the lighting up of antral trouble can be traced often to diseases of the teeth, the roots of which lie under its floor.

The dissecting-table reveals to the dental pathologist a curious state of affairs just here ; but, in order to grasp this situation fully, it is necessary to state what comes much more closely under the observation of the dental surgeon than the general surgeon, a fact that only the physiognomist studies, as it should be,—and that is, that in inheriting our tendencies we inherit a mixture. Small jaws with large teeth are the rule ; occasionally large jaws with small teeth, the back teeth of the father, the front teeth of the mother, or *vice versa ;* the jaws sometimes so narrow and cramped, and the teeth so large, that they crowd each other, and such a lack of blood in the jaw, from non-use in mastication, making bone and muscle without stamina. The result is that the large teeth of the upper maxilla, the roots being formed physiologically by addition to their length, are either forced through the floor of the antrum, or else, in the evolution of that chamber from six years to twenty-one, the periosteum fails to build thickly enough to cover these roots.

They are, however, always covered by the membranous lining of this cavity, else the vessels passing into the foramina of these teeth would be exposed to the atmosphere. All this is not likely to involve the antrum in pathological trouble so long as the roots of these teeth are sound ; but it may be fairly stated that more than one-half of the patients falling into the dentist's hands sooner or later have pulpless molars, the roots of which project through the floor of the maxillary sinus, and are objects more or less irritating to the tissues against which they rest.

Again, in the case of molars the roots of which do not pass through the antral floor, in the case of devitalization, an ordinary alveolar abscess may occur, with the sequelæ of absorption of the alveolar plate at the tip of the root, and the outflowing of pus into the antrum itself. It is true that an abscess in such situation might not be of grave consequences, yet it is plainly a situation of risk.

This may not often exist, for the reason that the widely-forked roots of the upper molars and their nearness to the outer walls of bone cause development of fistulous openings away from the antrum, and yet it is a source of danger, and as such should be studied.

Dentists devitalize and remove the pulp from the roots of such teeth. This is a very usual, almost daily, operation.

But while an earnest and faithful effort is made to perform this operation thoroughly, so attenuated are the canals of the molars that it is not at all certain that all the pulp is removed. In such a case it is easy to see that any filling-material forced into the root-canal may force particles of dead tissue through the foramen and into the tissues above, inoculating these with septic matter; or, if disinfectants have been used there, such as carbolic acid, corrosive sublimate, etc., may be forced through to the injury of a tissue, which has, as described in the outset, no drainage in case of chronic irritation.

I have said enough on this subject, I dare say, to call your attention to certain lesions of the antrum that are common ground of observation and treatment of both dentist and surgeon, and call attention in conclusion to a case, sometimes very grave, always painful, that of an impacted and abscessed third lower molar.

The same causes to which I have alluded as dwarfing the upper jaw conjoin to make the lower both small and short. In the evolution of the lower third molar, it seems less often to share in the dwarfing process than the corresponding upper tooth. In a word, it is often too large for the space between the second molar and the angle of the jaw. In consequence, its eruption is so interfered with that it may be either only partly erupted, or it may be impacted at an angle against the second molar, appearing through the gum slightly or not at all.

Abscess of this tooth often involves not only the tissues immediately around it, but the tissues of the throat become inflamed, and grave results ensue. It is pretty well established that throat-trouble of a serious or even fatal character has been set up by an agency seemingly so unimportant. Abscess opening into the pharynx is certainly one of the sequelæ of this trouble. I have been told of cases where the infiltration of pus between the muscles of the neck and connective tissue proceeded to the formation of fistulous openings on the stomach, with ordinary results of blood-poisoning.

I have said enough to indicate a common ground for dentistry and surgery in the two cases above cited. Many more might be mentioned, if time permitted, to strengthen the statement thereof.

## *Discussion.*

Dr. J. L. WILLIAMS said that the paper was meritorious in that it recognized the necessity of the dentist having a more extended knowledge of the principles of physiology and of surgery. Such knowledge would often save the dentist from making serious mistakes. He described a case in which a dentist with a first-class reputation as a skillful operator, and especially in correcting irregularities of the teeth, had a patient, a clergyman, who applied to him on account of faulty articulation which interfered with the plainness of his speech. On examination it was found that the front teeth did not occlude at all, and the dentist concluded to build them down with gold. He worked on these teeth several hours a day for four or five successive days, till the constant nervous strain, and the continual shocks to the brain from condensing the gold, caused the complete breakdown of the patient with paralysis, followed in a few months by death. A better knowledge would have taught this dentist that he was putting the nervous organization to a dangerously severe test.

Dr. R. R. ANDREWS said a dental student is supposed to get all the knowledge of medicine and surgery he needs in one year. It is impossible for him to learn it in that time. The study of surgery should be carried through the whole course. All may not be oral surgeons, but all should know enough to know the nature of a diseased condition when such a case comes to their notice. The dental graduate of the future should have more surgical training than those of the past or those of the present.

Dr. TAFT said the common ground of medical and dental study should include anatomy, physiology, pathology, and materia medica up to a certain point. The dental student should be as perfectly familiar with the medicaments which he uses as the medical student, and the knowledge of materials and processes should be as readily available to him as to the student of medicine. What difference whether a dentist or a physician is trying to restore a diseased part to a normal condition? The principles which must govern the restoration are the same, and the processes should be the same. The preparation of the dentist and the physician should therefore be the same. Of course, the dentist as a specialist has his attention centered upon a limited field; he has assumed to care for the mouth and its appendages, he has taken that for his special field of operations, and in certain respects he understands it better than the general physician does. How often does the physician or surgeon who is consulted about diseases of the mouth send the patient to a dentist, saying the dentist will or should know more about such disease than a physician or surgeon can. There is no reason why the dentist should not be qualified to perform all needed operations in the mouth as well as or better than the general surgeon, but he cannot qualify himself in two sessions of five or six months, and two years' instruction.

Dr. WM. A. MILLS said at least every dentist should be able to make a proper diagnosis, and to send patients to the surgeon or the physician with directions as to what should be done, rather than wait till the patient went of his own motion to the physician for him to find out what was the matter.

Dr. J. L. WILLIAMS said the title of M.D. or D.D.S. was only the mint mark; the bullion of knowledge only was of value, and it counts with or without the title. The pure gold is worth as much without the stamp as with it.

Dr. J. TAFT said the stamp indicates the purity and the amount of gold in the piece, and this, too, is what the professional degree should indicate, though in some cases it indicates nothing of the kind. All degrees should tell just what there is in their holders. This is what teaching institutions should aim to do when awarding degrees.

The common ground between medicine and dentistry is the conservation of health not of the teeth alone, but of the whole organization. Many dentists will not venture on a suggestion as to the health, say, of a sick child who is dying for the need of the application of a little knowledge which the dentist ought to have if he knows what he should. The lancing of the gums in a case of difficult dentition is a common ground which both physician and dentist should understand.

Dr. GEO. F. EAMES, of Boston, thought that dentists, as a rule, were scarcely qualified to claim recognition as medical men, though perhaps all ought to be so qualified. When we are as well grounded in the necessary knowledge as specialists in the diseases of the eye, the ear, and the throat are required to be, the fullest recognition will not be withheld ; but such recognition will never be granted while so large a majority of dentists have no claim to such qualification or no basis for the claim.

Dr. ROACH said his object in presenting the paper was principally to show how often the dentist found diseases in the mouth, and symptoms of general diseases, which it was not his province to treat, and that he should be in position to treat these diseases with the co-operation of the physician or else to refer them to a physician for treatment. Dentists have opportunity often to discover diseased conditions before they become so acute as to alarm the patient, but still are dangerous if allowed to develop. In such cases he should recognize the danger of delay, and counsel the patient as to the necessity of applying the proper remedies or seeking medical or surgical treatment. He mentioned a recent case in his own practice, where he had found an epithelioma which he had sent to a surgeon. It would be, of course, best for a dentist, unless specially qualified, to send such cases to a surgeon for treatment.

Dr. W. G. A. BONWILL doubted whether the assertion contained in the paper, that children inherited the back teeth of one parent and the front teeth of the other, could be proven. It was a question in his mind whether dentistry had any common ground with medicine. The profession of dentistry is very young. Has it progressed so rapidly in the few years of its life that it is ready to claim equality with so old a profession as that of medicine? Dr. Talbot said, only one year ago, that dentistry had made no progress in science in the last twenty years.

His early associations were all with surgery. He had seen Dr. D. Hayes Agnew perform an operation on the tibia which required one and a quarter hours, cutting, with a little tack-hammer and a chisel, the carious bone. The impression made upon him was so deep that it became the object of his life to invent some means to render such operations more rapid and less tedious to the surgeon, and less dangerous to the patient. He could scarcely rest till he had perfected the surgical engine, which will do the same operation in one-fourth of the time. He never had cause to complain of non-recognition from the most eminent surgeons, though he had no M.D. degree. Surgical operations about the face and jaws were the most terrible butchery of mankind till Dr. Garretson, in his practice and in his clinics, taught surgeons the use of the surgical engine.

Subject passed.

(To be continued.)

## FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

AT the regular monthly meeting of the First District Dental Society held on Tuesday evening, March 12, 1895, Dr. JAMES G. PALMER, chairman of the Clinic Committee, furnished the following report of the all-day clinic held at the New York College of Dentistry on that date:

Dr. J. W. CLOWES, New York city, presented a patient in whose mouth was exemplified what he terms "Oral Gardening," and described his methods.

Dr. NAAMAN H. KEYSER, Philadelphia, Pa., demonstrated his ready method of repairing combination metal and vulcanite work (see *Items of Interest* for August, 1891, page 463).

Dr. L. E. CUSTER, Dayton, Ohio, exhibited his electric furnace for fusing porcelain, giving a practical demonstration of its advantages.

Dr. BENJAMIN LORD, New York city, presented some delicate instruments for examination. They are the same as have been known for a long time as the sickle instrument, with the outer and inner edges of the curve grooved, which gives a decided edge that is sure to take hold of any foreign substance and not slip over it as the ordinary instrument of the same shape or curve is liable to. The pushing effort is equally as effective as the pulling with this instrument, in the removal of tartar, and it is found to be most useful in the final trimming of the margins of approximal fillings, as it will surely detect any roughness or overhanging of the edges of the filling. The instrument may be kept sharp by *wiping* the flat surface with a very fine sharp file.

Dr. F. R. RICE, North Adams, Mass., demonstrated his method of treating and filling root-canals.

Dr. F. HASBROUCK, New York city, extracted twelve teeth with gas,—five or six badly broken off. He desired to demonstrate the fact that gas could be given for any length of time by using the hood or face-piece, and that it is not necessary to see the lips at all.

Dr. T. S. WATERS, Baltimore, Md., presented for exhibition an attachment for the dental engine to be clamped to the upright; its use is for hot water and sterilizing purposes when operating with the engine. Also a convenient polishing-powder holder, which can be sterilized by heat; it is a very neat device.

Dr. J. W. WORCESTER, New York city, exhibited and demonstrated an effective little amalgam-carrier. It consists of a seamless metal tube, surmounted by a handle at one end and curved at the other for reaching various cavities, and a plunger, consisting of a strong metal rod (with spiral in the curved portion of tube), which serves to dislodge the amalgam from the tube wherever it may be carried. The instrument is loaded by pressing the curved end (with the plunger in the tube) into the amalgam, and unloaded by pressing the button on the straight end of the plunger until it strikes the handle.

Dr. CHAS. A. MEEKER, Newark, N. J., bleached a right superior central with pyrozone, 25 per cent. solution (see July COSMOS, 1894, proceedings Maryland Society).

Dr. GEORGE S. ALLAN, New York city, took about twenty minutes to bleach a fairly dark superior front tooth, using the five and the twenty-five per cent. ethereal solutions of hydrogen dioxid—McKesson & Robbins. The five per cent. solution was first used, principally for its solvent properties on oils, fats, etc. The cavity was swabbed out with it, and the ether not allowed to evaporate in the cavity. The bleaching was effected by the twenty-five per cent. solution, and its action hastened by the hot-air blast. An ordinary hot-air hand-syringe was employed. No special attention was given to the amount of heat.

Mr. HARRISON G. DYAR, New York city, exhibited the following: Microscopic preparations of a typical bacillus, a typical micrococcus, and a typical spirillum; cultures of ten species, illustrating the appearances on various culture-media of typical growth of bacilli, and the various colors they produce. The species were such as commonly occur in the air, in putrefying substances, etc., and hence readily find their way into the mouth. Samples of the more typical forms were shown, not exhibited specially under their specific names.

Dr. WM. P. RICHARDS, Orange, N. J., inserted a large contour gold filling in a right upper central incisor, extending from the labial to the lingual surfaces, starting with Steurer's plastic gold, using it half-way, building on with Rowan's soft gold, finishing with The S. S. White Dental Mfg. Co.'s 1000 fine. He also presented a clever piece of bridge-work in the mouth, which was much admired.

Dr. W. S. ELLIOTT, Trenton, N. J., exhibited a modified mechanical mallet driven by the Elliott suspension engine. This instrument, since the last exhibit, has been used by experts with the greatest satisfaction.

He also showed a new form of plate-clasp and its superior adaptation to the natural teeth. It consists of fine-tempered gold wire bent upon itself in such a manner as to form a loop around the tooth. It is more perfectly adjusted, is free from edges and angles, and is self-cleansing. No soldering is necessary to form anchorages to the rubber base.

Also, a new home-made matrix, simple in all its make-up, efficient in requirement, and inexpensive.

Also, a new disk mandrel, complete in one part, quickly manipuated, and capable of meeting all requirements.

Dr. A. H. BROCKWAY, Brooklyn, N. Y., gave an interesting and acceptable demonstration of his ideas regarding the employment of an assistant at the chair, showing the manifest advantage of such aid to the operator, in the saving of his time and strength and in contributing to the convenience and comfort of the patient.

With the help of his two lady assistants he showed how easily the rubber-dam could be adjusted, and how readily and effectually the mouth could be kept dry with napkins or rolls of absorbent cotton for minor operations. He also showed his method of removing tartar and polishing teeth, employing for the latter purpose the article known as "Tucum" or dental fiber, which seemed to be most admirably adapted to that use.

Dr. S. ELDRED GILBERT, Philadelphia, Pa., demonstrated the use of Gilbert's non-conductive tooth-lining in preventing shock from thermal change by sealing the dentinal tubuli and forming a thin, insoluble film over the surface of the cavity. The tooth prepared was hypersensitive to cold. One application of the lining removed all sensation, but three were made, as the pulp was almost exposed. The tooth was then filled with gold and finished. There was no sensation from cold water or air afterward.

The electric dental engine exhibited by Dr. J. E. SERRE, New York city, was made up of a Lundell fan motor, to the iron shell of which was clamped an insulated upright, terminating in a socket to receive the standard from the ordinary treadle engine. The motor was screwed to a base-board (wood) in which was set the controlling device, a small vulcanite button with short lever arm, movement of which lever to right or left through an arc of about two inches, started, stopped, or reversed the engine as desired. The device was portable, and could be placed in any relation to the operating chair. In the circuit was placed a small Carpenter rheostat, by which means, together with the rheostat on the motor, fifteen speeds were readily obtainable. This was capable of further modification by shifting the driving cord to other grooves of the driving pulley.

Dr. M. L. RHEIN, New York city, excavated a labial cavity on an inferior incisor. The cavity was acutely sensitive to the touch of the excavator, but was completely anesthetized by means of spray of chloride of methyl.

Dr. LEWIS N. SHIELDS, New York city, introduced a difficult contour gold filling, using the electric mallet.

Also, exhibited a porcelain-faced central crown in the mouth, and also a lateral incisor in the mouth, almost entirely built down with gold,—a very large contour, involving the whole palatal, one-half labial, and cutting-surfaces, which was done with the electric mallet two years ago.

Dr. CHAS. K. VAN VLECK, Hudson, N. Y., demonstrated his method of saving an old molar by building a platinum and amalgam crown in the mouth,—a method designed to be used on grinders that are too far gone to be crowned with gold in the usual way. (See COSMOS, April, 1893.)

Dr. W. WOOLSEY, Elizabeth, N. J., exhibited and explained the working of the "Harris Improved Pneumatic Mallet" and combination engine-head. The mallet is a small instrument not much larger than an ordinary lead pencil. It gives a good blow, which can be very quickly adjusted to light or heavy. The air-pump is attached to the engine-head, which is made with two pulley-wheels so the belt can be changed from the pump to the cable without stopping the engine. The cable can be dropped down while the pump is running. The whole apparatus is almost noiseless.

Dr. C. B PARKER, Brooklyn, N. Y., filled the right superior central after it had been bleached by Dr. Meeker. The cavity involved the lingual, mesial, and labial surfaces, and extended from gum-margin to lower third of crown. It was filled with Edward Rowan's soft decimal gold rolls without annealing or warming, strictly soft as we understand it, using foot-pluggers for packing.

Dr. Wm. E. Truex, Freehold, N. J., filled a left superior first bicuspid posterior approximal cavity, using soft gold and finishing with No. 30 rolled foil. He also exhibited a case of transplantation, right superior lateral. The subject, a young man, twenty one years of age, an ironer in a shirt factory, not in good general health; color of skin blue, circulation bad, and mouth in a thoroughly septic condition, with an accumulation of tartar about the neck of each tooth, and pus appearing at the margins of gums upon pressure. Tooth implanted one year ago, and in good condition now. An exhibition of what nature will submit to under certain conditions.

Dr. Z. T. Sailer, New York city, exhibited his sterilizing box. (See Cosmos, March, 1895, page 205.)

He also exhibited a napkin-holder for compressing napkin over sublingual and submaxillary ducts. The holder consists of a skeleton piece to fit under the chin. This piece has a slot with set-screw through which an upright piece slides up and down, and curved over at top to rest on the napkin; by means of the set-screw any pressure that may be desirable may be put on the napkin. The upright bar swings from one side to the other, leaving the mouth free for the operation, particularly so for the front teeth.

Dr. H. S. Sutphen, Newark, N. J., demonstrated his method of filling with amalgam and Steurer's gold, finishing with any foil desired, first cavity posterior approximal left superior cuspid. The cavity was filled about one-half full of Flagg's submarine amalgam, mixed as for an ordinary filling. To this was added Steurer's plastic gold until a good gold surface was obtained, and then the filling was finished with Williams foil No. 4.

Second cavity, left superior second molar, large crown cavity covering almost the entire masticating surface. Filled precisely as the first cavity.

Third cavity in inferior right second bicuspid, crown cavity. This was filled one-half full of amalgam, mixed as for an ordinary filling, and then continued with Steurer's plastic gold until the cavity was filled. The two crown cavities were filled without applying the rubber-dam.

The Steurer's plastic gold was inserted with the same instruments used for the amalgam, which were ordinary burnishers. When the surface of the filling became the same as any gold filling, the surface was roughened with a plugger-point and the filling continued and finished with foil as any simple gold filling, using ordinary gold-pluggers.

Dr. Chas. S. Hardy, Summit, N. J., was unable to clinic, as he could not obtain a patient. The nature of the operation he intended to perform was extraction and replanting to effect a cure in cases of pyorrhea alveolaris where the disease was conquered in all but say three or four teeth, and in cases where a limited number of teeth were involved and the disease could not be cured in any other way.

When he has failed to cure all of the teeth after treating with such remedies as one has at hand, he extracts the remaining ones, if there is but a limited number, removes the tartar, and replants them, —securely binding them in with silk floss,—dismissing the patient until such time as it is necessary to see him again. He takes a hypodermic syringe and a three per cent. solution of pyrozone, and carefully syringes the socket out. This may be repeated several times if necessary. For this purpose a hypodermic needle, with the point broken off and the end ground smooth, should be used.

After the tooth has been extracted, he thoroughly syringes out the cavity with a three per cent. solution of pyrozone. In about a week the tooth will usually get firm enough to allow the removal of the binding cords, and in the course of two or three weeks one will find that a tooth treated in this way will become much firmer than before extraction, and the exudation of pus entirely stopped.

He has been treating pyorrhea in this way for several years, and to his knowledge he has not failed in a single case.

Dr. JOHN H. MEYER, New York city, demonstrated his improvements to dental furnaces by baking some practical cases. His improvements consist of a preparatory muffle and annealing ovens, which can be applied to any dental furnace, but are especially adapted to the new Revelation oil furnace, and form in connection with it a neat, convenient, and practical apparatus, fully satisfying all requirements for baking continuous gum, porcelain inlays, block, crown- and bridge-work. The preparatory muffle is placed in the elbow of the furnace pipe, and so arranged as to utilize the escaping heat as it passes upward from the furnace and is distributed around the muffle (the heat in this muffle is about 1800 degrees). This preparatory muffle has a capacity for five cases, which can be placed in it before the oil is ignited, so that they may be gradually heated up (so important to porcelain); and when the lower muffle has attained the necessary baking heat, these cases may one by one be transferred to it, and when baked removed therefrom and placed in the asbestos-lined annealing ovens.

In a single muffle furnace but one case at a time can receive attention, and this is exposed at the front of the muffle to the full force of the baking heat, which strikes but one side of the case, while the other is comparatively cool. This unequal heating has a tendency to draw the body and enamel, so that a perfect result is not so readily attained. Another great desideratum is that by the keeping of the muffle constantly closed with the exception of the brief time required to insert a case (say ten seconds), the overheating of the laboratory is entirely avoided. It will readily be seen that in hot weather especially this is a most decided advantage.

Dr. W. H. TRUEMAN, Philadelphia, Pa., presented a method of supporting loose lower front teeth by firmly securing them to a bar of suitable width accurately fitted to the lingual surfaces. The procedure is as follows:

First. Through each tooth that is to be secured to the bar, clear through from the labial to the lingual surfaces, drill a hole to accommodate a screw-threaded wire, locating the same as nearly central as may be to the width of the tooth, and sufficiently near the cutting-edge to avoid encroaching upon the pulp.

Second. Accurately fit a bar, preferably made of a strong metal so as to secure strength without bulk, to the lingual surfaces of the teeth. It is desirable that this bar shall approach closely the cutting-edges of the teeth, and extend toward the gums sufficiently far that the lower edge will be below the most prominent portion of the tooth, and so less noticeable to the tongue. It is also desirable that it shall fit accurately the surface of the tooth, forming a matrix in which the tooth rests. The bar must be sufficiently thick to afford secure hold to the screws by which it is drawn closely to the teeth.

Third. Being provided with a screw tap, screw-threaded wire, screw nuts, and a drill to match, hold the bar firmly in place, pass the drill through the hole in any one of the teeth most convenient, and continue the hole through the bar. Withdrawing the drill, while the bar is still in place, tap the hole just made. It is important in most cases that the hole be threaded while the bar is in position, otherwise during the operation the direction of the hole may be changed. Now pass the threaded wire through the tooth and screw it into the bar, cut it off, allowing it to project beyond the labial surface of the tooth sufficient to accommodate a screw nut. If it can be done, it is best to solder the screw to the bar. The screw and bar in place, put a nut on the end of the screw projecting beyond the labial surface of the tooth, and draw it tight. In like manner proceed until each tooth is fitted with a screw and nut.

Fourth. Remove all the screws, laying them down in order so that they can again be quickly replaced ; coat each nut with a little oil or vaseline ; dry the teeth, coat them and the bar with zinc-phosphate cement, quickly place it in position, and immediately insert the screws, coating each one as it is placed in position with cement, and draw the nuts evenly tight. It is desirable that the cement shall fill all space between the bar and the teeth, and as thoroughly fill the holes through which the screws pass. After all is in place, it is well to work the cement between the teeth, filling any spaces which may offer lodgment to food *débris*.

Fifth. After the cement has well hardened, with suitable tools smooth off the ends of the screws projecting through the bar ; then remove the nuts, clip off the projecting ends of the screws, and polish them down even with the surfaces of the teeth, and remove the superfluous cement.

Respecting this operation Dr. Trueman says, "A bar to support loose lower teeth, fitting the lingual surfaces of the teeth, and secured to firm teeth by caps, collars, or clasps, or held in place by adaptation, is very old. I find record of these devices being used as early as 1830. Artificial dentures have been constructed of natural teeth secured to a metallic, bone, or ivory bar. I have no knowledge of this method of securing loose lower teeth to a bar by screws having been before suggested. If it has been, I will be pleased to know where the record may be found. I have found it practicable and satisfactory. The first case done, January, 1886, is still satisfactory."

Dr. W. G. Browne, Atlanta, Ga., exhibited his engine mallet, claiming for it the most acceptable blow, it possessing great impacting force with less inconvenience to the patient. He filled a right superior central incisor, mesial surface, large contour filling. A special feature was varnishing the cavity, and, while the varnish was in a sticky condition, he put in enough cylinders to entirely line the cavity, and pressed them all at once into position with cotton on the foil-carriers, then waited a short time for all the chloroform to evaporate, and proceeded to build out the filling with gold foil onto these cylinders of gold, which were cemented to the tooth with varnish. He did not use what are known as retaining pits, but shaped the cavity so as to retain the filling. This varnish is not used to retain the filling, its main purpose being to interpose a substance that will insulate the dentine from electric and thermal conditions. Incidentally it assists in starting the filling, and may play some small part in its retention.

He also showed his water-proof disks in polishing the filling after removing the rubber-dam and wetting the filling with saliva, claiming that these disks will, in addition to working under water, do more than twice the work of any other disk.

Dr. H. GRIFFEN MARSHALL, New York city, demonstrated his manner of separating teeth by the use of cotton wool and linen floss. He first tied a large knot in a piece of floss by passing the free end through the loop several times before drawing it tight. By doing this any size knot that is desired may be made. Pass the floss between the teeth to be separated, letting the knot (which should be large enough not to pass through) rest on the lingual surface ; pack a bit of cotton wool between the teeth, and tie the two ends of the floss over the cotton on the labial surface with a double knot, drawing the cotton wool well in between the teeth. In this manner teeth may be separated readily without soreness, and filled at next sitting if enough space has been acquired ; if not, repeat the operation. The amount of force is regulated by the tightness of the ligature. He claims that by using the two knots it is almost impossible to dislodge the cotton without first cutting the ligature.

Dr. A. H. GILSON, Boston, Mass., showed the "Davis angular hand-piece." It is made with the "head or end" moving round on a circle and placed at an angle of forty-five degrees, so that one can reach any part of the mouth very easily, and also reach any portion of a tooth. Being at such an angle, one never covers up the work with the hand as with the usual direct hand-piece. For buccal cavities it is very convenient, and for using the disk for finishing, the worth of it cannot be estimated. It locks at eight places, thus giving one all the positions required. It takes the ordinary burs, with a slight alteration at the end, or one can get burs all fitted.

It can be attached directly to the engine, thus doing away with the ordinary hand-piece, made with a "slip" joint, or with a sleeve, to fit over the hand-piece as the ordinary right-angles do.

It is very simple in its construction ; all the parts are made interchangeable, and will wear as long as any hand-piece. Can be easily taken apart to clean and oil.

One of its principal best points is its smallness, not being as large as the ordinary right-angle attachments in the market.

Dr. G. F. HARWOOD, Worcester, Mass., gave a demonstration in "obtunding sensitive dentine, using simple remedies." Method: Inclosed teeth in dam, cleansed the surfaces and cavities with alcohol, varnished the teeth (except the cavity to be excavated) with sandarac to protect from the air, either hot or cold ; dried the cavity with warm air, applied eugenol oil, this remaining a few moments was generally sufficient. In case of extreme sensitiveness washed out the eugenol oil and applied the "Robinson Remedy," or followed with chloroform and tinc. aconite root. He proved the efficiency of the "B. & R. hot-air syringe," which can be used with one hand, and the "Elliott separator," not new, but notable for its simplicity. He demonstrated this method upon a right superior central (very sensitive) approximal cavity, entirely controlling sensation, and upon a lower cuspid labial cavity, which was also found highly sensitive. The patient claimed that he felt no pain.

Dr. HENRY W. GILLETTE, Newport, R. I. Immediate and painless removal of living pulps of left superior first molar, and right superior first bicuspid, after injecting into the pulp-chamber a ten-per-cent. solution of cocain; the essential point to be demonstrated being the avoidance of all contact of the syringe-point with sensitive pulp-tissue. This is attained by having a selection of sizes and shapes of syringe-points, some with flanges for supporting Dunn syringe rubber cones, so the point may be fitted to the perforation into the pulp-chamber, making a tight joint at that point. If necessary, the immediate point of exposure is to be first dressed with a syrupy mixture of ninety-five per cent. carbolic acid and cocain, or other painless caustic, so the syringe-point shall not crush sensitive fibers. In cases difficult of access a temporary filling may be made with an opening through it, and the syringe-point fitted to the opening at the mouth of the cavity.

Separation of incisors and bicuspids with a very small separator, made of piano-wire, gauge No. 22, five-eighths of an inch long, with wedges of nickel, about one-eighth of an inch square at the base, and a washer of nickel, and steel nut about one-eighth of an inch cube, operated by a universal watch-key.

Dr. L. B. WILSON, Cumberland, Md., presented models demonstrating his method of electro-deposition for making crowns, bridge, or plates, which consists in first taking a plaster impression. If for crowns which are decayed away and shape lost, he simply takes wax and wax-knife in the operating-room and builds up on the broken or decayed tooth or teeth wax ends that correspond in size and shape to the natural tooth adjoining, then has the patient close his teeth to get antagonism.

Then take a plaster impression; build up the edges with more plaster; dry and pour in fusible metal (before the fusible metal sets place in it a good sized copper wire), separate, and cover the fusible metal with melted wax in all parts where one does not want the deposition to take place.

If for a bridge where porcelain teeth and metal caps are to be used, solder wide tissue platinum backings to all the porcelain teeth, slip the edges of the backings under each other on the plaster model, using just enough wax to hold them in position; remove from the model, place in the mouth and take a plaster impression (the porcelain teeth will all come away with the impression), pour in hot water to wash out the wax, dry, and pour in fusible metal and proceed as before described.

Plates are more simple to make by the same method. For the deposition use three solutions, gold, copper, and copper and aluminum. The last named is made by mixing the copper and aluminum solutions together, and all the solutions are kept at a temperature of 100° F. while the deposit is going on (time required, twenty-five hours). Place them first in the copper solution for ten hours; remove them, and at once place them in the gold solution for fifteen hours, when the shell on the models will be found sufficiently thick; then remove them, melt out the fusible metal, and finish up.

Dr. J. S. COMAN, New York city, filled an upper left central posterior approximal cavity, using Rowan's gold. The teeth were close together, and were allowed to remain so until ready for finishing, when a separator was used for a few moments only.

He also demonstrated his method of making all-gold incisors and cuspids. It consists simply of three hard metal plate-dies representing both labial and lingual surfaces, with central, lateral, and cuspid dies in separate plates for convenience in handling, and an asbestos ring for molding the hub. This system supplies a variety of forms for the various teeth, sufficient to cover almost any case.

Glancing over the dies, select the size and shape you think is right; determine certainly by making a wax impression from the die and trying in the mouth, or on a plaster model. Having thus selected the die to be used, take the asbestos ring, place over the die selected, and cast therein lead for a counter-die; then remove your counter-die and proceed to swage up your gold cap, both sections at once, after which cut, trim, solder, and fit, as in other methods.

Dr. W. E. RICHARDSON, Batavia, N. Y., demonstrated the combination of tin and gold fillings in crown and approximal cavities in bicuspids and molars. Ease and rapidity of manipulation, with adaptation and the tooth-saving qualities which they will produce, especially applicable to teeth that are over-sensitive and below the standard in structure. It is claimed that the tin will disintegrate in time; but with the proper amount of tin, and the masticating surfaces protected with soft and cohesive gold, we will have no more trouble from this source. This method requires a special set of hand-pressure instruments, made wedge-shaped, with deep serrations on all sides of the instruments running well up on the sides of the same, for the purpose of wedging and incorporating the metals together. Materials are prepared in the following manner: tin, S. S. White globe, and 1000 fine cohesive and soft gold foil is cut into one-fourth, one-half, and full sheets, and then crimpled together by a crimping machine and cut into suitable-size pellets; cavities prepared as for soft gold. Commence by filling cavity about one-half full with tin, condensing and incorporating as you work up. Then wedge and incorporate soft gold into the tin, and follow up with cohesive gold, filling and condensing the last portion with automatic plugger; finish up in the usual manner.

Dr. W. G. A. BONWILL's special clinic was to show by diagrams his latest revelation in dentistry. He informed us that so far the experimenting was satisfactory, and as soon as he could definitely settle upon the most certain and scientific way of shaping and inserting the innovation he would fully demonstrate it. By this method much annoyance and uncertainty would be saved to those who wished to follow his method.

The process has no name as yet further than "Implantation of Metal Tubes or Pins of Gold or Iridium, into the Solid Alveolar Processes," one or more, to retain one tooth, or full upper or full lower set.

By this means the artificial teeth are held firmly in place in the mouth with only enough plate to cover the ridge. The plates are removable, and are as firm as any of the best bridge-work or crowns.

In order to prevent the tubes from being loosened, the perfect laws of articulation must be understood, that no undue pressure laterally will be brought to bear on one side more than another to cause absorption of the processes. Or instead of tubes in all cases, heavy wire can be inserted with a head upon it for attachment to the plate, or with a screw, or by various other methods or appliances which require experimenting with before success can be claimed in the hands of the ordinary dentist. By this method no change can occur to the metal, nor can absorption of alveolus take place if the substitute is so placed in that the force is borne equally from all sides.

He is dead set against the bridging of modern dentistry, with so much gold showing, and the mutilation and vandalism of the human teeth. Necessity calls for some plan by which dentists can be taught to regard the profession as one of the highest arts known to the mechanical world, and all art should be made to conceal its own work. To this end he has always aimed and accomplished, and begs dentists to wait a few months for the result of investigations and experiments.

Dr. Bonwill had present a patient from Philadelphia, for whom he had placed in many large triple gold fillings, covering the whole mesial and distal, with grinding-surface of the first and second superior bicuspids, and the first superior molar, both sides, and the second bicuspid lower left. The object was to show his method of plus contouring. He has advocated for many years the separation of all teeth posterior to the cuspids, both upper and lower, by placing in pink gutta-percha (never the white). It is the best of base-plate material. This is placed in in one solid piece between the teeth, and no separation made between the teeth. The whole space is completely filled, and in the course of three weeks to six months the masticating upon these teeth gradually forces them apart from the pressure upon the gutta-percha. It does not expand, but is driven apart.

The spaces thus gained save tooth-substance, pulps are retained alive, pain is lessened, more lasting results are insured, and the space in time gives greater facility for placing in the gold.

The spaces between the molars should be much greater than between the bicuspids, as the former teeth have so much wider surfaces and more incline to decay if no such precaution is taken.

He called special attention to the advantage of gradually wedging the molars farther apart, and in all cases having so much space at the cervix that no secretions can accumulate, nor even saliva remain long in contact from capillary action. The great object, however, is to get plus space, that the alveolus may again grow far up on the cervix and give support to the gum at this point, which, when the roots are too close together, is absorbed, and the gum has nothing to which to cling for life. Hence the gum at the cervix is always loose and never firm, allowing the food and mucous secretions from the gum to be held at the cervix, and a recurrence of decay is sure to take place.

Plus contouring of all fillings he advocates, and he assures us that the articulation of the teeth is not interfered with, as when the spaces are filled on several sides the teeth rearrange more perfectly. He gains space unconsciously, and while it is such a saving in every way to the patient, it gives him command of all his patients, so that he can call them in at any time he desires.

The present system, and as hitherto practiced, allows of stagnation at every cervix. He claims still further that no proper full contour can be made unless the filling is carried as far out on the buccal and palatal and lingual surfaces of the bicuspids and molars, as to prevent contact of any tooth-substance.

He further claims that the cavity at the cervix cannot be cut away when the rubber-dam is first placed on. He never does it, only when he goes to fill after weeks of separation by the gutta-percha.

He showed how he makes all matrices for both gold and amalgam out of the gutta-percha, and how it can be made to hold up the rubber at the cervix when no clamp will do it, by warming and then pressing up the dam ahead of it and holding until cold.

Dr. GEO. W. BLEEZARDE, New York city, practically demonstrated the Revelation oil furnace, baking sample blocks of teeth, and specimens of porcelain, proving that this furnace will produce a perfect result every time, without a possible chance of gassing or change in the material used ; Dr. S. H. Close's body and enamel being used for all the samples baked. Mr. Robert, representing H. J. Caulkins, of Detroit, in conjunction with Dr. Bleezarde, exhibited and demonstrated the Revelation oil furnace, the Midget gas furnace for small crown- and bridge-work, a metallurgical hearth containing many features, as melting furnace, gasoline generator, and blow-pipe and other laboratory appliances.

Dr. SIDNEY S. STOWELL, Pittsfield, Mass., demonstrated his improvement on the Hollingsworth system of crown- and bridge-work, the details of which are as follows : Having established the abutments of the bridge with crown in place, a "bite" of plaster of Paris is taken, and crowns removed with the bite. Models are made from the "bite," using the crown articulator. The "bite" is cut away, leaving the crowns in place on the models as they were in the mouth, with the occluding teeth held by the articulator. Porcelain facings are fitted between the abutments and against the gum, leaving one-thirty-second of an inch space at occluding or biting surface.

The facings are backed with pure gold, and held in place with wax.

Using the die plate, a set of hollow copper cusps are swaged No. 32. These cusps are selected and placed in position over the tip of the facing and against the occluding teeth. Being thin and soft, they are easily bent and burnished so as to fit the occluding teeth, conforming to any irregularity of surface to a nicety.

Support cusps with soft wax. Open articulator and take small impression of cusps, allowing plaster to extend onto either abutment. Remove plaster, taking with it all the copper cusps, and with this plaster transfer cusps to a smooth surface of Melotte's moldine. Place over this the rubber ring, and make a die and counter-die of Melotte's metal, and swage a strip of No. 32 high-carat gold to extend when in place from one abutment to the other. This is waxed in place, and the case is ready to solder.

The advantages are that the case is completed at one soldering. The occlusion is perfect, as the thin cusps conform to the surface of occluding teeth. Much time is saved, as the "dummies" are all soldered with the bridge at one heating.

At 4.30 P.M. Dr. Frank Abbott, dean of the New York College of Dentistry, delivered a brief lecture in the amphitheater on the etiology, pathology, prognosis, and treatment of alveolar abscess.

Exhibits were made by twenty-seven establishments.

# UNION CONVENTION OF THE WASHINGTON CITY DENTAL SOCIETY AND THE MARYLAND STATE DENTAL ASSOCIATION.

(Continued from page 531.)

## FIRST DAY—*Afternoon Session.*

THE convention was called to order at 2.30 P.M.; Dr. J. Roland Walton in the chair.

### *Discussion of Dr. B. F. Arrington's Paper.**

Dr. MARSHALL SMITH, of Baltimore, thought the paper advocated extraction of teeth that could be saved. He had treated anterior teeth that were so loose they could have been easily extracted with the fingers, and restored them to good condition. In some cases it required very long treatment, sometimes as long as six months. To thoroughly remove every particle of deposit it was necessary to carefully select suitable scalers. They must be very sharp. If a single particle of the deposit is left, the trouble will return. He thought many dentists were too indifferent about the matter to treat carefully, and long enough, to reach a successful conclusion.

Dr. C. C. HARRIS, of Baltimore, said the author's treatment appeared to consist in dissolving the deposit on the roots with sulfuric acid, and then removing it with the dull scalers shown, and above the gums with pumice on a stick and sharp scalers.

Dr. W. G. A. BONWILL, being asked to take part in the discussion, said that his views on the subject of pyorrhea had been published some time ago, and he had nothing new to offer. The author of the paper was right in saying there were too many remedies, and that too many people were trying to make reputations by proposing new ones. Bad dentistry is responsible for pyorrhea and mechanical troubles which can be corrected. Bad articulation causes irritation and brings on the disease. The articulation is the first thing he looks to when a case comes to him. Much trouble would be saved if the dentist always saw that no hard particles, or even soft particles, were left around the necks of the teeth of their patients when they left the office. Much of this trouble might be prevented if proper tooth-brushes were used in the proper manner. Brushes should not be too wide, and they cannot be too stiff, and should be used not by drawing them across the teeth, nor even by a rotary motion, but by wiggling the brush so as to get the bristles between the teeth. This will prevent stagnation in these localities. In filling the teeth he makes all fillings *plus contour*, and has never seen a case of pyorrhea that he could attribute to any disease of the system. There has been a vast amount of discussion recently, started by Dr. Peirce, but nothing proving the disease to be of systemic origin. He had never had a case of pyorrhea in his original practice,—that is, in a case where he had had charge of the teeth from childhood.

Dr. WM. A. MILLS said some years ago he wrote a paper which was very severely criticised, in which he had described a method of treatment of pyorrhea with magnesia, boracic acid, and oil of wintergreen, followed by sulfuric acid. He did not think the disease ever could be cured by any treatment, but the condition will cease for as long as the treatment is continued and proper care of the mouth is taken; but when the patient quits using the powder the disease will return. He had had such cases after two years of freedom from the trouble, and by re-treating them had cured them again. He had recently been using tartarlithine with good results. In his opinion a permanent cure is not to be hoped for with any treatment.

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*"Pyorrhea Alveolaris." See DENTAL COSMOS for June, page 525.

The subject was passed, and Dr. A. W. SWEENEY, of Washington, read the following paper:

## DENTAL EDUCATION.

The essayist said that the derivation of the word "education" seemed to indicate that the uneducated need to be led away from certain habits to which they are prone, hence the term might be defined to mean a leading away from error toward the truth. If we accept that definition as correct, it becomes apparent that teaching the truth is the only legitimate occupation for the educator.

Dental education, while peculiar in detail, is identical in general principles with all other branches of education in that its true aim is to supply the knowledge needed to enable those who adopt dentistry as their calling to avoid the errors of ignorance, and to profit by the results of research and experience.

Since those who practice dentistry are generally designated as doctors, or teachers, it is but natural that those unlearned in its peculiar departments of knowledge—that is, the general public—should expect those doctors to be men of broad and liberal education, able to appreciate their needs and fertile in resources for their relief; and whenever they detect any deficiencies in the sum total of the knowledge which they have a right to expect, their disappointment not only affects the individual found wanting, but reacts unfavorably upon the entire profession as a class; hence it becomes most obvious that the education of the dentist should be thorough and comprehensive enough to fit him for all the exigencies of practice.

The public, however, has a right to expect from professional men something more than mere intellectual attainment. There is a vague but general impression that the professional man should differ somewhat from the rest of mankind, in addition to being the possessor of certain peculiar knowledge. There is no actual social superiority of the professional over the producing and commercial classes; but in the relations of these different classes with those who are respectively known as clients and customers there is a great difference, and in this lies the secret of that rather vague impression that a professional man should stand on a somewhat higher plane than his neighbor who is in trade. The merchant may, with propriety, sell the roughest and poorest productions as well as the finest. The purchaser has the right to make use of his own senses, and the old phrase, *caveat emptor*, rings in his ears, admonishing him to exercise due care; but with the professional man the case is widely different. His client is first induced to consult him because he has, or hopes to have, confidence in his professional ability and integrity. He goes to him to receive the benefit of that peculiar knowledge of which he himself is profoundly ignorant, and he expects—has the most unquestionable right to expect—nothing short of the very best and most valuable help which that peculiar knowledge fits its possessor to give. That they frequently fail to find it is but too true, and when one reflects upon the number of times that they find themselves deceived, the wonder is that the high regard for the professional classes is not sadly lowered. It would be, but for the faithful efforts of those who properly appreciate the responsibilities of the profession.

Dentistry, being young, has had to bear the burden of probably a greater proportionate number of illiterate and unworthy members than any other of the liberal professions. Its ranks have become crowded with those possessing little or no adequate educational qualifications, and in many instances utterly devoid of all true professional instinct; and as there has been virtually no legal restriction placed upon the indulgence in practices which are injurious to the public and absolutely fatal to that high esteem to which the humane calling is entitled, the only wonder is that the profession has been able to carry forward such a load of reproach so steadily and to advance as rapidly as it has done. The profession cannot hope to purge itself from the contaminating influence of charlatans until efficient legal protection—not for themselves, but for the public—is provided. Laws which merely establish a certain standard of knowledge as sufficient to admit one to practice will never accomplish the needed result. What a man does is of more practical moment than what he knows, and to allow an unblushing quack to fatten upon the community while screening himself upon a college degree or the certificate of an examining board is as absurd as it would be to expect the law courts to ignore malpractice by attorneys, or the clergy to wink at the wolf in sheep's clothing who might expect the cloth to protect the betrayer of innocence. All these should receive "the greater damnation."

As an illustration of what might be accomplished by effective legislation, the following extract from a recent magazine article is instructive. Calling attention to the Illinois State Board of Health, it says, "It examines and verifies diplomas, determines the standing of legally chartered medical institutions, examines non-graduates as to their qualifications as practitioners, and issues certificates or licenses to practice to such as pass satisfactory examinations, and refuses *or revokes* [italics mine] certificates to ignorant practitioners, or for *unprofessional and dishonorable conduct.* Up to the present time it has examined and verified the diplomas and licenses of two hundred and seventy-five institutions and licensing bodies. It has definitely rejected the diplomas of twenty-eight institutions on grounds of fraud and gross invalidity. It has required the diplomas of twenty-six other institutions to be supplemented by examination; and it has issued certificates, based on the diplomas of legally chartered medical institutions in good standing, to 9212 practitioners. It has rejected in ten years 2283 applicants, for the following reasons:

"First. Failure to present a diploma from a legally chartered medical institution in good standing, as defined by the board. [The board has adopted a schedule of minimum requirements to which every institution must at least comply.]

"Second. Failure to sustain a satisfactory examination sufficiently strict to test the qualifications of a candidate for the practice of medicine.

"Third. Personal or professional antecedents, habits, or associations warranting the charge of unprofessional and dishonorable conduct.

"Fourth. Proved intent to practice in an unprofessional and dishonorable manner, as by claiming to cure incurable diseases, to possess unusual skill, experience, or facilities, and similar claims involving deceit and fraud upon the public.

"The most fortunate thing for the welfare of the inhabitants of the United States would be the existence of these regulations in every state and territory."

If applicable to the regulation of medical practice in the state of Illinois,—and the test of ten years would seem to have demonstrated its usefulness,—should not all honorable dental practitioners throughout the land hasten to unite their efforts for the purpose of procuring similar enactments, which would serve to rid the country of those whose only object is "to practice in an unprofessional and dishonorable manner," and whose "antecedents, habits, and associations warrant the charge of fraud upon the public and unprofessional and dishonorable conduct"?

After efficient laws are provided, the way to a still better state of things will be through the fields of broader, better education. The aim of the teachers should be to supply a *higher quality*, not so much a greater number, of new men to fill up the ranks of the profession. There should be shown more of that spirit which animated those few men in this community who established the first college of dentistry in the world, and established it, not in the hope that it would prove a money-making venture for themselves, but that it should become a source from which might be derived the knowledge which should enable those disposed to avail themselves of it to go out and minister to the needs of suffering thousands. True, it is not reasonable to look for too many genuine philanthropists, and the teacher, surely, along with all others who labor, "is worthy of his hire"; but the unprejudiced observer must sometimes be forced to the conclusion that too many who lack the proper qualifications are attempting to be teachers, and that too many institutions pretending to teach dentistry have come into existence. It is the opinion of many that the true interests of the profession would be promoted if there were fewer colleges, so that the limited support scattered among some of the weaker ones could go to strengthen and render more efficient the work of those which are stronger and better equipped. Does it seem probable that two colleges in a given city, each with a dozen or twenty students, can do better work than if the students all attended one? Hardly so. Truly able teachers are not over plenty. Consequently the less efficient professors had better be content with the title of plain doctor, and give their efforts to the support of one good school, rather than continue attempts to maintain separate establishments, which usually give rise to more or less unhealthy rivalry.

With a decreased number of institutions to be supported, the opportunity would be afforded to exercise a more wholesome discrimination in the selection of students. The time has gone by—'tis a pity that it ever should have been—when a dentist may be evolved in a few short months from a rough, uncouth plow-boy. It would be as reasonable to expect to raise a fine crop of rare exotics on a piece of barren, rocky ground in a single season. There should be a keener and closer discrimination exercised in the choice of students, and not only should the effort be made to gauge their mental capacity, so as to estimate their ability to assimilate the required amount of knowledge necessary to fit them to practice intelligently, but preference should be given to those who show promising evidence of the possession of those finer and higher qualities which distinguish the true professional man. There is little fear that any really worthy ones would be kept away, while in such a course there is every reason to expect a great improvement in the fitness and reputability of the graduates sent out from the colleges.

Within the recollection of your essayist some advance has been made in this direction among the better established and supported colleges. Some preliminary test of fitness is demanded, and the term of attendance has been lengthened ; and yet, within that same time, many new institutions have come into being, and evidence is not lacking to prove that some of them derive but a precarious support, and, presumably, furnish but indifferent instruction.

It would be better, far better, for all parties, if, in order to bring about the needed improvement in this direction, the number of colleges should decline greatly, and the number of students graduated each year should become proportionately less. Rather than that hundreds of indifferently taught young men should be sent out each season, it would be better to have dozens who would give promise of becoming ornaments to the profession.

Though but few may be fitted by nature, or can be rendered fit by art, to fill the very highest station possible in modern dentistry, since that requires a keenness of perception, a delicacy of manipulative dexterity, a degree of refinement of feeling, certain social qualities, an artistic instinct, a power of concentration of effort, and a sturdy power to resist the ever-present temptation to slight some detail of the daily routine of work, far above the capacity of the masses, he who is fairly well equipped with the plainer essentials, and who possesses that degree of self-respect which tends to make him wish to give value in return for what he receives, can, with proper education, hope for an honorable, if not an enviable, place in our profession ; and it is the plain duty, and should be the greatest pleasure, of those who undertake to educate him, to see to it carefully that all his best traits are fostered and developed, while any wrong tendencies are checked and corrected. The dental college is in no sense a Sunday-school ; therefore with the spiritual training of the student it has nothing whatever to do. But along with all the "collateral branches," and all the "matters of pure science," it should especially aim to teach, and to develop to the utmost, that peculiar manipulative dexterity for which the practitioner has such great and constant need, and in all its teaching it should aim to be broad and comprehensive, and to embrace all methods of known utility. It is a common complaint that in many colleges but one method of using gold is taught, possibly but a single preparation ever used. But as the greatest possible technical skill, if not supplemented by other qualities, will not suffice to produce a truly high type of professional man, the student should be taught, from first to last, that he is being trained to follow a liberal and humane calling ; that the number and size of the fees he may take will not constitute the true measure of his success, but that it must be estimated by the sum total of the good he may accomplish for those he serves.

### *Discussion.*

Dr. H. B. NOBLE, of Washington, wished to emphasize his approval of one or two points in the paper. The first was the necessity of framing laws that would reach that class of dentists who have diplomas and abuse their right to practice. Our laws, up to the present time, only look to the granting of license to practice, and not to any means of revoking such license for malpractice or unprofessional conduct. The right to revoke for malpractice should be incorporated in the laws.

Another point is the desirability of uniformity in laws. This should be sought for and obtained as nearly as possible, then every dentist having the right to practice in one state should be allowed to practice in another state without further examination, and a man who was legally practicing without a diploma should be allowed to receive one without having to spend three years in passing through a college.

Dr. W. S. TWILLEY, of Baltimore, thought it was too much to hope for in the present that all the examining boards would accept certificates from the others without question ; but the way to reach this desirable state of affairs was to continue to cultivate united respect and confidence by using every possible means to get only the best men appointed to such boards.

Dr. C. C. HARRIS, of Baltimore, thought one of the best ways to raise the standard of education and practice among the dentists would be the better dental education of the people, so they will better know what the dentist can and should do. The course of dental literature for the people, as advocated by Dr. Faught, would serve this purpose by reacting upon the profession. Such literature should emanate from the national dental association.

Some men who pass the very best examinations are yet surprisingly unfit for practice. The diploma should not only be an evidence of their knowledge of the theoretical part, but also of their practical ability as operators.

Dr. WM. A. MILLS, of Baltimore, said that what Dr. Harris said of dentists was frequently true also of physicians. As students they pass good examinations in physiology, anatomy, obstetrics, etc., but when examined in the practice of medicine only get through by the skin of their teeth ; but receive the diploma on account of the good marks in theoretical branches. The rule should be that no one should receive a diploma in medicine or dentistry who had not passed a good examination in methods of practice and actual work.

Dr. SWEENEY said the subject of dental education is near akin to dental legislation. His principal design in writing the paper was to serve as a reminder that we are a profession, and of the constant need to grade up a little higher all around.

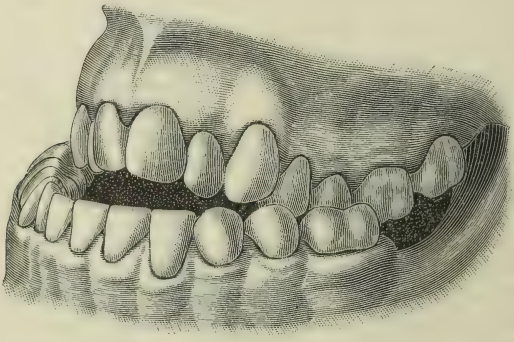
It is surprising that the laws have uniformly failed to reach the most important need,—that is, the need of a decided check upon the quacks and charlatans in the profession. We need a law that will revoke the diploma or license of the unprofessional practitioner, and then we can educate the public to know that the dentist is not a mere extractor of teeth and a maker of plates, but that his real business is to save the natural organs.

The discussion was closed, and Dr. F. F. Drew, of Baltimore, read the following paper:

### A Case of Masking.

In 1893 Miss A., aged eighteen, called to consult me regarding a case of irregularity. It was one we all know as a case of "Jimber Jaw," or excessive protrusion of the inferior maxilla. I do not think I ever saw a more pronounced case. The disfigurement was so great that the young lady had become morbid on the subject, and at the earnest solicitation of her friends she, two years before I saw her, applied to a dentist to have the deformity corrected by the use of appliances. She was under treatment for two years, at a cost to her of eight hundred dollars, and the accompanying model will give you some idea of the amount of improvement reached in that time (Fig. 1).

Fig. 1.

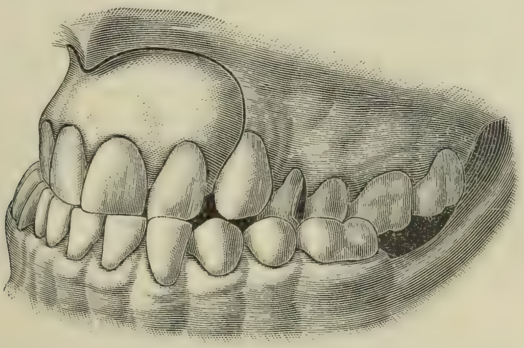


She was naturally very much discouraged, and when she came into my hands was not very sanguine that anything could be done for her relief. In giving me a history of the case, she said that in childhood she met with an accident in which the inferior maxilla was fractured. A surgeon was summoned, who reduced the fracture, but improperly, and this was followed by ankylosis, which produced a permanent disfigurement. After hearing her story I came to the conclusion that it would be impossible to successfully correct the deformity by ordinary methods, and with the experience of the other dentist before me I concluded not to try. I was naturally at a loss to know what to do under the circumstances, and as I did not wish to extract the upper front teeth, realizing that after absorption her appearance would be still worse, I decided to adopt the following method.

I took an impression, in plaster of Paris, of the upper jaw. A model was obtained from this, and from the model a die and counter-die in metal. A platinum plate, 27 gauge, was then swaged to cover the space on the die representing the surface from cuspid to cuspid, running it up as high as the frænum, extending over the laterals and centrals, and lapping over their cutting-edges, the part lapping over being punched with holes and roughened.

The plate was then placed upon the model, and four plain plate incisors of the right size and color were arranged to articulate correctly with the lower natural teeth and soldered to the platinum plate. This was then transferred to the plaster model and waxed extensions made back to the second bicuspids, gold clasps being fitted to the first bicuspids. The whole appliance was then flasked and vulcanized, the surface of the rubber being covered with *pink* rubber, as I was afraid it might show when she laughed, and the pink would be more in color-harmony with the mucous membrane. After finishing the rubber part of the fixture, everything was completed but the addition of gum in front. For this purpose I backed the surface of the platinum around the teeth, and pressed celluloid around them, the surface being stippled to imitate mucous membrane. The appliance was then transferred to the mouth and telescoped accurately over the four natural incisors, completely masking them, the celluloid blending nicely with the natural gum. The front teeth articulated correctly with the lower, and enabled the young lady to prehend properly, something she found it impossible to do before.

FIG. 2.



The improvement in her appearance was correspondingly very great, and she was naturally elated at the change which had been accomplished without any pain to her,—quite a contrast to what she had gone through with two years before. She was of course directed to remove the plate frequently, so that the natural teeth could be thoroughly cleaned in order to prevent decay. I have delayed reporting this case, as I wished to see how it would stand the test of time, and I had the good fortune to see the patient a year and a half after the work was done, and found that everything was progressing favorably.

The accompanying model (Fig. 2) will give some idea of how the mouth looked when the mask was worn.

After reading the paper, Dr. Drew passed the models around the room, and in reply to a question as to how he overcame the ankylosis, said he did not overcome it, but found just room enough to take the impression Being asked if there was any bad effect on the natural teeth from wearing the fixture described, he replied that he had recently examined the case and found the teeth uninjured.

Convention then adjourned to meet at 8 P.M.

(To be continued.)

## ILLINOIS STATE DENTAL SOCIETY.

THE thirty-first annual meeting of the Illinois State Dental Society was held at Galesburg, May 14 to 17, 1895. About two hundred were in attendance. The following-named persons were elected officers for the ensuing year: Walter A. Stevens, Chicago, president; C. R. Taylor, Streator, vice-president; Louis Ottofy, Chicago, secretary; Edgar D. Swain, Chicago, treasurer; J. R. Rayburn, Fairbury, librarian; W. A. Johnston, Peoria, chairman executive committee. The next meeting will be held at Springfield, May 12 to 15, 1896.

LOUIS OTTOFY, *Secretary*,
Masonic Temple, Chicago.

## TEXAS DENTAL ASSOCIATION.

THE fifteenth annual session of the Texas State Dental Association was held at Houston, May 22, 1895, in the dental depot of Stuart & Adams. The attendance was larger than for a number of years, and much interest was manifested. A number of new members were received.

The following officers were elected for the ensuing year: Dr. L. P. Robertson, Marlin, president; Dr. O. B. Love, San Antonio, first vice-president; Dr. M. S. Merchant, Giddings, second vice-president; Dr. T. L. Masterfield, Dallas, curator of museum; Dr. J. G. Fife, Dallas, secretary and treasurer.

Waco was selected as place for next meeting, on the third Tuesday in May, 1896.

J. G. FIFE,
*Secretary and Treasurer.*

## CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

AT the annual meeting of the Central Dental Association of Northern New Jersey the following officers were elected: Wm. P. Richards, president; Walter Woolsey, vice-president; Wm. L. Fish, secretary; Charles A. Meeker, treasurer; Geo. E. Adams, Oscar Adelberg, C. S. Hardy, F. C. Barlow (chairman), J. L. Crater, executive committee.

WM. L. FISH, *Secretary.*

## DENTAL SOCIETY OF THE STATE OF NEW YORK.

AT the annual meeting of the Dental Society of the State of New York, held May 8 and 9, 1895, the following officers for the ensuing year were elected: Dr. H. J. Burkhart, Batavia, president; Dr. C. K. Van Vleck, Hudson, vice-president; Dr. C. S. Butler, Buffalo, secretary; Dr. J. I. Hart, New York, treasurer; Dr. R. Ottolengui, New York, correspondent.

C. S. BUTLER, *Secretary.*

# DENTAL COLLEGE COMMENCEMENTS.

## UNIVERSITY OF PENNSYLVANIA—DEPARTMENT OF DENTISTRY.

At a public commencement, held Thursday, June 13, 1895, at the American Academy of Music, Philadelphia, Pa., the degree of Doctor of Dental Surgery was conferred by Charles C. Harrison, A.M., provost, upon the following candidates, after which an address was delivered by Horatio C. Wood, M.D., LL.D., Professor of Materia Medica, Pharmacy, and General Therapeutics, and Clinical Professor of Nervous Diseases:

| NAME. | STATE OR COUNTRY. |
|---|---|
| William C. Achard | Switzerland. |
| William L. Aitken | Australia. |
| George S. Allen | Illinois. |
| William P. Angle | Pennsylvania. |
| Carlos A. Barrios | Nicaragua. |
| Hass D. Best | Pennsylvania. |
| A. Mark Bradner | Pennsylvania. |
| Charles A. Bushong | Pennsylvania. |
| D. R. Campbell, L.D.S. | Scotland. |
| Victor Carballo | Uruguay. |
| Harry L. Cleaver | Pennsylvania. |
| Walter E. Decker | Pennsylvania. |
| W. E. S. Dobbyn | Australia. |
| Edmond J. Donnegan | Pennsylvania. |
| William Dudderidge | Canada. |
| Jonas G. Dudley | Massachusetts. |
| David Dunlop, L.D.S. | Scotland. |
| Charles S. Evans | Pennsylvania. |
| Joseph E. Faulk | Pennsylvania. |
| J. D. Forrest, L.D.S. | Scotland. |
| Walter R. Garretson | Iowa. |
| Willis P. Grandy | Arkansas. |
| Sheward Hagerty | Pennsylvania. |
| George H. Hahn | Pennsylvania. |
| William E. Harris | Virginia. |
| Newton C. Hassell | Pennsylvania. |
| Edward A. Hoenig | Pennsylvania. |
| J. Herbert Hood | Pennsylvania. |
| Joseph M Houston | Pennsylvania. |
| C. S. Hurlbut, Jr. | Massachusetts. |
| Fred C. Kemble | Ohio. |
| John A. Kilmore | Pennsylvania. |
| Franklin F. Kribbs | Pennsylvania. |
| Oscar Lang | Wisconsin. |
| Roman J. Levy | Russia. |
| S. A. A. Lewis | Rhode Island. |
| J.A. Lopez, Lascano | Ecuador. |
| José Rafael Madan | Cuba. |
| J. Boyd Mader | Pennsylvania. |
| Arthur G. Maitland | New Zealand. |
| F. B. Manchester | New Jersey. |
| R. Middleton, D.V.S. | Pennsylvania. |
| W. J. Moorhead | Pennsylvania. |
| Charles S. Myers | Pennsylvania. |
| Samuel F. Nabers | Alabama. |
| William B. Noble | Pennsylvania. |
| Charles F. Odell | Ohio. |
| Alfredo Pimienta | Spain. |
| Frank J. Potter | New York. |
| Wm. T. Robinson | Pennsylvania. |
| Armand Rous | Indiana. |
| G. B. Saxenmeyer | Pennsylvania. |
| J. Harry Schaffer | New York. |
| A. O. Schwabe | Austria-Hungary. |
| Daniel E. Sorg | Pennsylvania. |
| Adam C. Spangler | Pennsylvania. |
| Rolof B. Stanley | Pennsylvania. |
| Ira B. Stilson | Connecticut. |
| H. C. Sturtevant | Pennsylvania. |
| Isaac R. Tann | Pennsylvania. |
| Fred G. Taylor | Wisconsin. |
| Philip A. Traynor | Delaware. |
| Clyde A. Van Valin | Pennsylvania. |
| David S. Watson | Illinois. |
| T. Fred'k Watters | Ohio. |
| Frank P. Welch | Oregon. |
| Frederick M. Wells | Canada. |
| William C. Wells | New York. |
| Edward Wishart | Pennsylvania. |
| William H. Yale | California. |

The number of matriculates for the session was two hundred and seventy-eight.

## UNIVERSITY OF CALIFORNIA—COLLEGE OF DENTISTRY.

The annual commencement exercises of the College of Dentistry of the University of California were held at Odd Fellows' Hall, San Francisco, Cal., on Thursday evening, June 13, 1895.

An address on behalf of the faculty was delivered by William Cormack Reith, D.D.S.

The number of matriculates for the session was one hundred and seventy.

The degree of D.D.S. was conferred on the following graduates by Martin Kellogg, A.M., LL.D., president of the university:

William A. Atwood.
Frederick R. Axton.
Thomas F. Barrett, B.S.
Herbert A. Bernard.
John N. Borger.
John B. Bowles.
James A. Brown.
Louis E. Brun, B.S.
Byron L. Carpenter.
Ralph C. Coleman.
David M. Coney.
Eugene M. Dodson.
Oscar P. Fitch.
James G. Fitzgibbon.
Arthur M. Flood.
Arthur J. Ford.
Reuben L. Hale.
Eminel P. Halsted.
John R. Hardy.
Charles P. Hauselt.
Edward S. Holloway.
Joseph A. Jeffrey.
William B. Ludlow, Jr.
Francis A. McCan.
Amiel Morris.
Robert E. O'Connell.
Clarence H. Pearce.
Robert H. Porterfield.
Frederick E. Sawyer.
Leo Sichel.
Walter E. Singleton.
Robert W. Smith
Harley H. Stephenson.
Edward L. Strain.
Arthur L. Tibbetts.
Newton B. Wachhorst.
Edwin R. Waterman.
Frederick H. White.

## NORTHWESTERN COLLEGE OF DENTAL SURGERY.

THE tenth annual commencement exercises of the Northwestern College of Dental Surgery were held at Kimball Rehearsal Hall, Chicago, Ill., on Wednesday, April 10, 1895.

The valedictory address was delivered by James Archibald Black, B.S., and the doctorate address by Professor F. H. B. McDowell.

The number of matriculates for the session was forty-three.

The degree of D.D.S. was conferred on the following graduates by Dr. J. A. Whipple, dean of the faculty: M. O. Read, Illinois; W. P. Ranger, Illinois; J. A. Black, Ontario, Canada; J. C. Packard, Wisconsin; Anton Mueller, Austria.

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# DENTAL SOCIETY ANNOUNCEMENTS.

### AMERICAN DENTAL ASSOCIATION.

THE local committee have arranged with the following hotels and houses for the session of the American Dental Association commencing Tuesday, August 6, 1895:

The "Coleman House," fronting the ocean, the largest hotel in Asbury Park, with rates from $3.50 to $4.00 per day, with the use of the ball-room during stated periods of the day and evening for large committee meetings and sections; the "West End Hotel," a first-class hotel opposite the "Coleman House," rates from $2.50 to $3 00 per day, with the use of ball-room at stated periods for committees and sections; the "Ocean Hotel," next door to the "West End," capacity nine hundred, first-class in every respect, rates based on one hundred or more guests at $2.50 and $3.00 per day, with the use at stated periods of small parlors for committees; the "Hotel Brunswick," near the ocean, first-class in every respect, from $3.00 per day up and $20.00 per week up. This hotel has a series of small parlors on the main floor for committees and private receptions, the use of same based on number of dental convention guests at the hotel.

In the large hotels the use of the rooms for committees and sections is based on the contract of a certain number of guests; therefore the selection of a room ahead in some hotel is necessary. July 15 is the time the hotels would like to know.

In the small hotels, the "Grand Central," rates $1.50 to $2.50 per day and $14.00 to $16.00 per week; the "Ashland," $2.00 per day and $8 00 to $12.00 per week; the "Portland," $2.00 per day and $8.00 to $10.00 per week; the "Edgemere Inn," $2.00 to $2.50 per day and $12.00 to $20.00 per week; the "Neptune," a nice, quiet place, $1.75 to $2.00 per day and $9.00 to $20 00 per week; the "Albany, $2.00 per day and $8.00 to $20.00 per week; the "Clifton," $2.00 per day and $15 00 per week; the "Strand," $2.00 per day and $10.00 per week.

The committee will have an attendant at the Auditorium from July 27 to August 9 to give information in reference to hotels and other information to the inquiring members. The trolley cars run direct from the depot to the Auditorium. A map of Asbury Park, with cuts of the hotels and the Auditorium, will appear in the New Jersey program, which will be mailed to every member of the American Dental Association.

Chas. A. Meeker, Chairman,
C. W. F. Holbrook,
C. S. Stockton, *Local Committee.*

## PENNSYLVANIA STATE DENTAL SOCIETY.

The next meeting of the Pennsylvania State Dental Society will be held at Eagles Mere, Pa., July 9, 10, and 11, 1895. Hotel accommodations have been secured at reduced rates.

An exceptionally good program is at present promised, with papers and clinics by men of eminence in the profession. Business of great importance will be presented, and a new constitution is to be acted upon.

Give your profession the benefit of your judgment, and make a sacrifice, if need be, to attend.

Howard E. Roberts, *Cor. Secretary*,
1321 Walnut street, Philadelphia, Pa.

## VIRGINIA STATE DENTAL ASSOCIATION.

The twenty-sixth annual meeting of the Virginia State Dental Association will be held at the White Sulphur Springs, West Virginia, Tuesday, August 13, 1895, at 10 A.M.

The Executive Committee intend that this shall be the best meeting in the history of the association.

The lessees of the "White," the greatest health resort in the country, have agreed to give us and our guests, families included, a rate of $2.50 per day from Saturday, August 10, to Monday, the 19th, inclusive.

Those who have attended our meetings do not need to be assured that a hearty welcome will be extended them. Those who have not are invited to come and try us.

J. Hall Moore, *Cor. Secretary*,
Richmond, Va.

## MAINE DENTAL SOCIETY.

THE thirtieth annual meeting of the Maine Dental Society will be held at Bangor, July 16 and 17, 1895. The Executive Committee assure an attractive program.

The state board of dental examiners will meet at the same time and place.

F. A. KNOWLTON, *Secretary*,
Fairfield, Me.

## INTERSTATE DENTAL MEETING.

THE committees appointed by the state associations of Iowa, Nebraska, Colorado, Kansas, and Missouri to arrange for the interstate dental meeting to be held at Excelsior Springs, May, 1896, will meet at Pertle Springs, Mo., July 10, 1895. A full attendance is desired.

J. P. ROOT, *Chairman General Committee*.
S. C. A. RUBEY, *Secretary*.

## NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE annual meeting of this body will be held at Asbury Park, N. J., on Saturday, August 3, 1895, at 10 o'clock A.M. It is very desirable that all the colleges having membership be promptly present at that hour, as much important business will be before the association, and the time allotted is usually short for the work to be done.

The Executive Committee of the association will meet on Friday previous at 10 o'clock, at the same place. All business for that committee should, so far as possible, be in their hands before the meeting, in order that there be no delay.

J. TAFT, *Chairman Executive Committee*,
LOUIS OTTOFY, *Secretary*,
Masonic Temple, Chicago, Ill.

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# EDITORIAL.

## THE NEW YORK DENTAL LAW.

IN the developmental progress of dentistry, no other factors have had such a continued and sustained interest as that which attaches itself to questions of dental education and dental legislation. Both of these departments present problems which so directly affect the conditions of individual practice that each practitioner of dentistry is concerned in their solution, whatever may be the character of his motive.

The interdependence of the legislative and educational advances in dentistry is so clearly mutual that whatever affects the one produces its impress upon the other. Their growth must be harmonious, or no substantial progress can be made. Any essential lack of proper correlation between the two at once gives rise to controversy and discord, which seriously impedes further advance until harmony is once more restored. Before, however, a just balance can be struck in the mutual relations of our educational and legislative problems, it is essential that each of these fundamental factors of dental progress shall itself be correctly proportioned in its several elements and free from self-contained errors that must necessarily operate detrimentally if not disastrously.

A fundamental error which is clearly manifest in much of our dental legislation is a misconception as to the true relations of the parties in interest, upon the part of those to whom the preparation and passage of our dental laws is intrusted.

As we have elsewhere on several occasions pointed out, laws are an expression of the will of the people, the majority of the community. They are not intended for the protection and benefit of a select class, and all legislation conceived in opposition to this fundamental idea becomes obnoxious as soon as it is operative.

It is clearly evident that dental legislative enactments which, in their operation, secure for the community better dental service by forcing a higher standard of dental educational requirement before a license to practice is granted, are to an equal degree beneficial to dentistry as a profession by improving the qualifications of its members.

But this latter is an effect, not the primal intent of the law, and the relations of *meum* and *tuum* in this regard must be rigidly kept in mind, not only in every effort to secure dental legislation, but in order that when dental enactments are secured, they shall be effective, just, and equitable in their operation.

The new dental law of New York, which goes into effect August 1,* presents some features which, in view of the prominence of the state whose mandate it is, are worthy of careful study. This is especially true at this time, as the growth of our knowledge by practical experience has developed certain essential principles in dental legislation that should be taken into account in any new efforts in this field, and unless the latest New York law is fully abreast of modern requirements, it should not be unquestioningly accepted as a model law for adoption by other states.

The most striking innovation of this new law is the clause which vests in the Board of Regents the power to suspend a person for a limited season from the practice of dentistry or to revoke his license unconditionally for sustained charges of unprofessional or immoral conduct, or of gross ignorance or inefficiency in his profession.

By process of law to deprive a citizen of his means of livelihood is in itself a serious matter, and in no case should it, nor, in fact, can it, be permitted, excepting where it has been unmistakably proven that the pursuit of a calling by an individual is a distinct menace to public health, life, or morals. In order to determine the justice of such a proceeding, the common law of the country, recognizing the gravity of the question, provides for the trial of the case by a jury.

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* For the law in full, see page 631 of the current number.

To vest discretionary power respecting this matter in a board composed of men, even of unimpeachable integrity, is an innovation so radical that a question of its fundamental legality may well be raised on the ground alone of its repugnance to the common law of the land.

Examination of candidates for license to practice dentistry in the state of New York is provided for in the new law by the creation of a Board of Dental Examiners, who, under the wording of the law, become practically an autocratic body. The character of the examination, the educational standard to be attained, are left absolutely to the discretion of the Board of Examiners in connection with the Board of Regents.

The clause relating to this important feature is as follows :

"The board, in connection with the regents, shall frame rules from time to time for the regulation of their own proceedings and for the examination of candidates for license to practice dentistry."

There is no specification of the subjects upon which the candidate must pass an examination, and no provision for appeal from the findings of the board in case the applicant has reason to question the fairness of the examination.

Further, it is not evident from its wording that the law is mandatory with respect to the examination of all candidates for license to practice within the state, graduates and non-graduates alike.

In the Dental Cosmos for July, 1894, we discussed at some length a similar state of affairs with respect to the dental law of Pennsylvania.

Let us by all means throw every possible safeguard around our professional fabric, and exclude from it the incompetent, the inefficient, and the immoral ; but in doing this see to it that no injustice is done by excluding the worthy. To vest a board of dental examiners with absolute power to make law, to fix the destiny of men without let or hindrance, to establish their own rules of government and their own standards of examination,—a law that directs that they shall satisfy themselves without providing for appeal from their findings, or fails to provide for examinations, the results of which may be used in evidence in case of appeal, is, in our opinion, not only improper legislation, inequitable and unjust, but it implies a degree of infallibility upon the part of the board which, in the present stage of human weakness and frailty, is hardly warrantable. Such laws should be replaced by legislative enactments more in harmony with the fairness and equity which characterize our American institutions.

## CORRECTION.

In Dr. Essig's paper on "The Scientific Spirit and the Ethics of Dental Practice," published in our last issue, the copy as furnished us contained several errors which the author desires to have corrected.

On page 497, line 33, for "honest" read "earnest" practitioner; on the same page, line 40, for "he found the dentist," read "the family dentist"; on page 499, line 4, for "frail" read "frailest" teeth.

In our report of the union meeting at Baltimore, page 522 of the same issue, Dr. W. A. Mills, of New York, is credited with the authorship of a paper. It should be Dr. Wm. A. Mills, of Baltimore.

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## DR. JONATHAN TAFT.

It is not uncommon for members of dental and other societies, members of the bar and other associations, to meet and pass resolutions of love and respect for a member who has been gathered in by the grim reaper.

This is especially the case when the departed member has gained prominence in his special line of life or profession. The Dental Cosmos and some other dental journals have what are known as obituary departments, set apart for record of the deaths of dentists and for some words of biography and eulogy. The Odontological Society of Cincinnati met on the 28th of April and honored a *living* member of the society and of the profession. At a special meeting held at the offices of Drs. H. A. and H. T. Smith, a beautiful bronze statuette from the French Salon, representing the Morning Star, by A. Gandez, was presented to Dr. Jonathan Taft by members of the Odontological Society of Cincinnati, as a token of fraternal love and respect for the brother who has so faithfully served his profession for half a century.

The figure is about two and a half feet high, and represents a woman holding aloft a glittering star in a graceful and joyful attitude. Drs. Smith, Hunter, and Callahan, gentlemen of taste, selected and purchased the present for the society.

Dr. H. A. Smith made the presentation speech, and feelingly recalled the qualities which have made Dr. Taft so dear to his professional brethren. He honored him, first, as a progressive and yet a conservative practitioner, ever in the front ranks of true progress; second, as an educator and lecturer, whose influence must have helped to make dentistry what it is to-day; third, as one of the oldest dental editors and writers, and as an author whose works have been translated into foreign tongues and have been authorities wherever dentistry is known and taught; fourth, as the originator of more dental societies than perhaps any living man, a missionary in this frontier field of progress; fifth, as still continuing in the good work after fifty years of persistent, unselfish labor for the good of his chosen profession.

There were seventeen members present, and every one in turn rose and acknowledged his personal indebtedness to the life and work of Dr. Jonathan Taft.

He was taken entirely by surprise, and for once his fluent speech was broken, with the eloquence, however, of modesty and gratitude. He said, "I have loved my profession, but I have only done what you have done. I am not worthy of such distinction. I cannot express myself,—how can I say it, my gratitude? Why didn't some one tell me the object of this meeting?"

When we remember that the Odontological Society of Cincinnati is composed of the immediate neighbors of Dr. Taft, some of whom have known him for half a century and others for from ten to twenty years, we may believe that some prophets have honor even in their own country.—C. M. W.

# OBITUARY.

## DR. LUDWIG ADOLF WEIL.

DIED, at Munich, April 13, 1895, Dr. LUDWIG ADOLF WEIL, in the forty-sixth year of his age.

Dr. Weil was born in Wallerstein, on the 12th of August, 1849. His parents soon moved to Munich, where he attended school, gymnasium, and the university. He received his medical degree in Strasburg, in 1873, and became assistant physician in the Munich Hospital. From 1875 to 1876 he attended lectures at the Pennsylvania College of Dental Surgery, in Philadelphia, where he graduated with the degree D.D.S. Returning thereafter to Munich, he soon established an important practice, and was appointed court dentist to H. R. H. Prince Louis of Bavaria. In 1888 he became instructor in dentistry in the University of Munich, passing the state examination to meet the requirements of his university position.

The zeal and ability of Dr. Weil in his chosen profession are well known. He was an excellent practitioner, an attentive observer, and careful investigator. Of his scientific works, first mention should be made of his Examination Essay, "Histology of the Tooth-Pulp," which stands to-day as a boundary mark in the development of our knowledge of this subject. In this dental histological research Weil devised and employed an elaboration of v. Koch's petrifying method as applied to the study of mollusca. This new method made possible the study of the hard and soft tissues of the tooth *in situ*, an achievement theretofore unattained; and as one among other important outgrowths of its application, Weil was enabled to discover and describe an entirely new dental histological formation, which he termed the "basal layer of the membrana eboris." He has made many other contributions to dental literature, among which may be mentioned essays on "Reimplantation," "Concerning Impressions," "Fillings of Amalgam and Cement," and several papers for the dental and medical periodicals of his own country.

Dr. Weil was eminently scientific in his tastes, and gave much of his time and thought to the pursuit of his interests in that direction. He was highly esteemed by all who knew him for his kindly, amiable qualities, and his early decease is a serious loss, not only to his immediate circle, but to that wider circle who value and appreciate the genuine scientific spirit in dental professional work.

Dr. Weil was married in 1887, and his widow with one child, a daughter, survive him.

# DENTAL LEGISLATION.

## AMENDED DENTAL LAW OF NEW YORK.

AN ACT *to amend article nine of chapter six hundred and sixty-one of the laws of eighteen hundred and ninety-three, entitled "An act in relation to the public health, constituting chapter twenty-five of the general laws," by revising said article and vesting the power of granting licenses to practice dentistry in a State board of dental examiners and assimilating in that regard the licensing of dentists to the licensing of physicians, and also to provide punishments for violation of the provisions of this act.*

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Article nine of chapter six hundred and sixty-one of the laws of eighteen hundred and ninety-three, entitled "An act in relation to the public health, constituting chapter twenty-five of the general laws," is hereby amended so as to read as follows:

### ARTICLE IX.

### PRACTICE OF DENTISTRY.

Section 160. Licentiates.
161. State board of dental examiners.
162. Examinations, licenses, registration, fees, revocation of licenses.
163. Construction of this article.
164. Penalties.

Definitions, as used in this article.—The terms university, regents, and physicians have respectively the meanings defined in article eight of this chapter. Board, where not otherwise limited, means the board of dental examiners of the State of New York. Registered medical or dental school means a medical or dental school, college, or department of a university, registered by the regents as maintaining a proper educational standard and legally incorporated. Examiner, where not otherwise qualified, means a member of the board.

§ 160. Licentiates.—Only the following persons shall be deemed licensed to practice dentistry:

1. Those duly licensed and registered as dentists in this State prior to the first day of August, eighteen hundred and ninety-five, pursuant to the laws in force at the time of their license and registration.

2 Those duly licensed and registered after the first day of August, eighteen hundred and ninety-five, pursuant to the provisions of this chapter.

§ 161. State board of dental examiners.—On the first day of August, eighteen hundred and ninety-five, the State board of censors of the Dental Society of the State of New York, as the latter body shall be composed at the date of such appointment, shall become the board of State dental examiners. The existing division of said censors into four classes and their terms of office shall remain the same for the said board, except that said terms shall expire on the thirty-first day of July in each year. Before the day when the official terms of the members of any of said classes shall expire, the regents shall appoint their successors, to serve for the term of four years from said day. Such appointments shall be made from nominations made by such society from a list of nominees twice the number of the outgoing class furnished prior to the third Tuesday in May of each year by the State Dental Society. In default of such nominations, the regents shall appoint such examiners from the legally qualified dentists in the State belonging to the said State Dental Society. The regents shall also fill vacancies in the board that may occur by death, resignation, or otherwise than by expiration of a term of office. All nominations and appointments shall be so made that every vacancy in the board shall be filled by a resident of the same judicial district in which the last incumbent of the office resided. The board shall convene at the call of the secretary of the regents within not less than two weeks after appointment and organize by electing, to serve for one year, a president and secretary. These officers shall be elected annually. No person shall be appointed an examiner unless he has received a dental degree from a body lawfully entitled to confer the same, and in good standing at the time of its conferment, and has been engaged within the State during not less than five years prior to his appointment in the actual and lawful practice of dentistry. Cause being shown before them, the regents may remove an examiner from office upon proven charges of inefficiency, incompetency, immorality, or professional misconduct.

§ 162. Examinations.—The board, in connection with the regents, shall frame rules from time to time for the regulation of their own proceedings and for the examination of candidates for license to practice dentistry. But no person shall be examined by said board unless he be at least twenty-one years old, of good moral character, and shall receive a certificate from said regents that he has satisfied them by examination or otherwise, that prior to commencing his professional studies he had a preliminary education equivalent to that required of students entering the dental colleges of this State, which, after January first, eighteen hundred and ninety-seven, shall be not less than a full high school course; and either has been graduated in course, with a dental degree from a registered dental school, or else, having been graduated in course from a registered medical school with the degree of doctor of medicine, has pursued thereafter a course of special study of dentistry for at least one year in a registered dental school, or holds a diploma or license conferring full right to practice dentistry in some foreign country and granted by some registered authority. Any member of the board may inquire of any applicant for examination concerning his qualifications and may take testimony of any one in regard thereto, under oath, which he is hereby empowered to administer. Degrees.—A person having lawfully received a dental degree in course from a registered dental school, or the degree of doctor of medicine from a registered medical school, and having thereafter lawfully practiced dentistry for the term of five years, may apply to the regents for the degree of master of dental surgery, which degree the regents may confer after examination of the applicant by the board under such rules and regulations as the regents and the board shall frame. No degree in dentistry shall be conferred in this State on any candidate who has not before matriculation in the institution conferring it, filed the certificate of the regents that he has had a satisfactory preliminary education, which for those matriculating after January first, eighteen hundred and ninety-seven, shall be not less than a full high school course. Licenses.—On certification by the board of dental examiners that a candidate has successfully passed the examination and is competent to practice dentistry, the regents shall issue to him their license so to practice pursuant to the rules established by them. Upon the recommendation of the board, the regents may also, without the examination hereinbefore provided for, issue their license to any applicant therefor who shall furnish proof satisfactory to them that he has been duly licensed to practice dentistry in any State or country after full compliance with the requirements of its dental laws, and has been thereafter lawfully and reputably engaged in such practice for five years next preceding his application; provided, that his preliminary and professional education shall have been not less than that required in this State. The regents may also license any applicant on the certificate of the board that after due investigation or examination it finds his education and professional attainments and experience of not less than five years in actual practice to be together fully equal to the requirements for license in this State. Every license so issued shall state upon its face the grounds upon which it is granted, and the applicant may be required to furnish his proofs upon affidavit. Registration.—Every person practicing dentistry in this State and not lawfully registered before this act takes effect, shall register in the office of the clerk of the county where his place of business is located in a book kept by the clerk for such purpose, his name, age, office and post-office address, date and number of his license to practice dentistry, and the date of such registration, which registration he shall be entitled to make only upon showing to the county clerk his license or a duly authenticated copy thereof, and making an affidavit stating his name, age, birthplace, the number of his license, and the date of its issue, that he is the identical person named in the license, that before receiving the same he complied with all the preliminary requirements of this statute and the rules of the regents and board as to the terms and the amount of study and examinations; that no money, other than the fees prescribed by this statute and rules, was paid directly or indirectly for such license, and that no fraud, misrepresentation, or mistake in a material regard was employed or occurred in order that such license should be conferred. The county clerk shall preserve such affidavit in a bound volume and shall issue to every licentiate duly registering and making such affidavit a certificate of registration in his county, which shall include a transcript of the registration. Such transcript and the license may be offered as presumptive evidence in all courts of the facts stated therein. The county clerk's fee for taking such registration and affidavit and issuing such certificate shall be one dollar. Any licentiate practicing dentistry in any county of the State other than that in which he first registered shall in like manner register in the latter county also, and may do so upon presenting to the clerk thereof his certificate of registration from the clerk of a former county and the payment of a fee of twenty-five cents. Examination fees.—Every applicant for license to practice dentistry shall pay a fee of not more than twenty-five dollars. From the fees provided by this article the regents may pay all proper expenses incurred by them under its provisions, and any surplus at the end of any academic year shall be paid to the society nominating the examiners to defray its expenses incurred under the law. Revocation of licenses.—If any practitioner of dentistry be charged before the regents with unprofessional or immoral conduct, or with gross ignorance or inefficiency in his profession, they shall notify him to appear at an appointed time and place, with counsel if he so desire, before the board to answer said charges, furnishing to him a copy thereof. Upon the report of the board that the accused has been guilty of unprofessional or immoral conduct or that he is grossly ignorant or inefficient in his profession, the regents may suspend the person so charged from the practice of dentistry for a limited season or may revoke his license. Upon the revocation of any license the fact shall be noted upon the records of the regents and the license shall be marked as cancelled of the date of its revocation. Upon presentation of a certificate of such cancellation to the clerk of any county wherein the licentiate may be registered, said clerk shall note the date of the cancellation on the register of dentists and cancel the registration. Upon the presentation to the regents or a county clerk of a certified copy of a court record showing that a practitioner of dentistry has been convicted of felony, that fact shall be noted on the record of licenses and the clerk's register, and the license and registration shall be marked cancelled. Any person whose license shall be suspended or cancelled shall be deemed, while such punishment is in force, an unlicensed person and as such subject to the penalties prescribed for other unlicensed persons who practice dentistry.

§ 163. Construction of this article.—This article shall not be construed to prohibit an unlicensed person from performing merely mechanical work upon inert matter in a dental office or laboratory, or the student of a licentiate from assisting his preceptor in dental operations while in the presence and under the personal supervision of the instructor, or a duly licensed physician from treating diseases of the mouth or performing operations in oral surgery. But nothing in the provisions of this article shall be construed to permit the performance of dental operations by any unlicensed person under cover of the name of a registered practitioner. Any student of dentistry whose certificate of study under private preceptorship shall have been duly filed with the secretary of the State Dental Society at the time this act takes effect pursuant to the provisions of the law then in force, may present himself for examination to the board under the same conditions as those under which he might have presented himself for examination before the censors of the State Dental Society under the laws in force when his certificate was filed; providing, however, that he shall file a notice with the regents on or before the first day of September, eighteen hundred and ninety-five, that he purposes availing himself of this exemption.

§ 164. Penalties —(*a*) A person who, in any county of this state, practices or holds himself out to the public as practicing dentistry, not being at the time of said practice or holding out a dentist licensed to practice as such in this State and registered in the office of the clerk of such county pursuant to the general laws regulating the practice of dentistry, is guilty of a misdemeanor, and punishable upon conviction of a first offence by a fine of not less than fifty dollars, and upon conviction of a subsequent offence by a fine of not less than one hundred dollars, or by imprisonment for not less than two months, or by both such fine and imprisonment. Any violation of this section by a person theretofore convicted under the then existing laws of this State of practicing dentistry without license or registration shall be included in the term a subsequent offense.

(*b*) A person shall be deemed guilty of a misdemeanor, and upon every conviction thereof shall be punished by a fine of not less than five hundred dollars or by imprisonment for not less than six months, or by both fine and imprisonment, who

(1) Shall sell or barter or offer to sell or barter any diploma or document conferring or purporting to confer any dental degree or any certificate or transcript made or purporting to be made pursuant to the laws regulating the license or registration of dentists; or

(2) Shall purchase or procure by barter any such diploma, certificate, or transcript with intent that the same shall be used as evidence of the holder's qualification to practice dentistry, or in fraud of the laws regulating such practice; or

(3) Shall, with fraudulent intent, alter in a material regard any such diploma, certificate, or transcript; or

(4) Shall use or attempt to use any such diploma, certificate, or transcript which has been purchased, fraudulently issued, counterfeited, or materially altered either as a license or color of license to practice dentistry or in order to procure registration as a dentist; or

(5) Shall practice dentistry under a false or assumed name; or

(6) Shall assume the degree of bachelor of dental surgery, doctor of dental surgery, or master of dental surgery, or shall append the letters B.D.S., D.D.S., M.D S. to his name, not having had duly conferred upon him by diploma from some college, school, or board of examiners legally empowered to confer the same, the right to assume said titles; or shall assume any title or append any letters to his name with the intent to represent falsely that he has received a medical or dental degree or license.

(*c*) Any person who in any affidavit or examination required of an applicant for examination, license, or registration under the laws regulating the practice of dentistry shall make willfully a false statement in a material regard shall be guilty of perjury, and punishable upon conviction thereof by imprisonment not exceeding ten years.

(*d*) All fines, penalties, or forfeitures imposed or collected for violations of the foregoing provisions relating to dental practice and the corresponding sections of the penal code must be paid to the State Dental Society. Said society may prefer a complaint for violation of the law regulating the practice of dentistry before any court, tribunal, or magistrate having jurisdiction, and may, by its officers, counsel, and agents aid in presenting the law and facts before such court, tribunal, or magistrate in any proceedings taken.

§ 2. Laws repealed.—Of the laws enumerated in the schedule hereto annexed, that portion specified in the last column is repealed, but it is expressly provided that any license or registration duly obtained in this State prior to the first day of August, eighteen hundred and ninety-five, without fraud and in full compliance with provisions of the laws in force at the time of its procurement, shall not be affected by the repeal of those laws, but shall continue to be as valid as it was at the time of its procurement.

§ 3. This act shall take effect upon and after the first day of August, eighteen hundred and ninety-five.

### Schedule of Laws Repealed.

Laws of 1868, chapter 152, all of section seven after and including the words "whose duty it shall be," and all of sections eight, nine, and ten; laws of 1876, all of chapter 331; laws of 1879, all of chapter 540; laws of 1881, all of chapter 376; laws of 1889, all of chapter 337; laws of 1892, all of chapter 528.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

**The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.**

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# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING MAY, 1895.

*May 7.*—No. 538,662, to MICHAEL DEUTSCH. Dental floss-holder.
" *14.*—No. 539,076, to DANIEL C. MCNAUGHTON. Dentiscalp and mouth-mirror.
" *21.*—No. 539,645, to CHARLES H. RICHARDSON. Dental engine.

THE

# DENTAL COSMOS.

VOL. XXXVII. PHILADELPHIA, AUGUST, 1895. No. 8.

## ORIGINAL COMMUNICATIONS.

## AN INVESTIGATION OF THE PHYSICAL CHARACTERS OF THE HUMAN TEETH IN RELATION TO THEIR DISEASES, AND TO PRACTICAL DENTAL OPERATIONS, TOGETHER WITH THE PHYSICAL CHARACTERS OF FILLING-MATERIALS.

BY G. V. BLACK, M.D., D.D.S., SC.D., JACKSONVILLE, ILL.

(Continued from page 571.)

### *Fourth Paper.*

### CONTRACTION AND EXPANSION OF SILVER-TIN AMALGAMS.

FROM time to time the subject of the contraction and expansion of the silver-tin amalgams has been brought prominently before the dental profession. Generally the statement has been that, when placed in cavities, some amalgams contract in setting while some other amalgams expand. This contraction and expansion has generally been attributed to the components of the alloy, but what components or in what proportions has apparently not been determined, or, if so, the proportions necessary to prevent change of bulk have not been pointed out. However, J. Foster Flagg* has attributed the expansion to silver and the contraction to tin, and has pointed out that the change of bulk depended on the proportions of these metals in the alloy. After reading him carefully, it has seemed to me that, though he speaks of making measurements and illustrates instruments for the purpose, his conclusions are derived mostly from theoretic considerations. Drs. Hitchcock and Bogue† have done important work in the measurement of the contraction and expansion of amalgams. Unfortunately, the arrangement of the instrument used by these gentlemen was such that the amalgam to be measured was pressed upon by a spring which, even though very delicately adjusted, would tend to produce the apparent contraction measured.

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* "Plastics and Plastic Filling."

† Transactions of the New York Odontological Society, 1874.

The very great readiness of amalgam to slowly yield to light continuous pressure, even after hardening considerably, seems to have been unknown to these experimenters. For these reasons the results of their experiments have not the weight they otherwise would have. Also, John Tomes* has made the effort to determine this question by the specific-gravity process, in which he found the amalgams experimented upon contracted. This plan is also open to serious objection. In taking the specific gravity of the metals with precise accuracy, it is necessary first to dissolve away a film of gas, or air, which clings tenaciously to the surface,—a matter that requires considerable time. Changes in the bulk of amalgam begin immediately the mass is made, and there is danger that a considerable part of the change of bulk will have occurred before the necessary preparation can have been made. My experience in the determination of the specific gravities of the metals has for these reasons led me to pass this plan as too uncertain to be applicable.

Many others have made more or less experimental study of this subject without arriving at definite results. Most of the plans of study adopted have led to confusion of results, the same alloy giving different results at different times without the reasons for the differences becoming apparent. Especially has this been the case with glass-tube experiments, in experiments in making fillings in ivory, and in natural teeth after extraction. I have shown in the July issue of the DENTAL COSMOS that only confusion could result from the latter method, on account of the hygroscopic changes in the material. Glass tubes, though the material is more stable, seem not to have given definite results. They cannot do so for the reason that the results are in no wise measurable.

The great importance of this subject has led me to give it close consideration from every standpoint that my knowledge of physics could suggest, and for a long time the difficulties seemed so great as to almost prohibit any attempt at a rigid experimental study of it. It is of little consequence that we demonstrate that this amalgam has contracted or that that amalgam has expanded in this or that experiment. What the dental profession and the men who supply its members with alloys for amalgams need to know is *the conditions of the contraction and expansion of amalgams*, including the formulæ of alloys, and whatever else may influence it. If these were known, the study of ways and means of preventing change of bulk could proceed ; but so long as these conditions remain unknown the attempt at prevention must be mere blundering. It has been my object and study to devise means of determining the conditions of this contraction and expansion, and to place them before the profession in such a manner that others may follow them and improve them, so that finally, by the work of numbers, personal equations may be eliminated from the work and perfect results attained. With this end in view, the plans of those who have preceded me have been studied and passed, one by one, as giving too many opportunities for error, or as being too cumbersome to allow of the multitude of experiments which the study of this subject seems to demand. The plans need to be simple and exact.

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* Transactions of the Odontological Society of Great Britain, vol. iii.

Dr. E. K. Wedelstaedt, St. Paul, Minn., has for a number of years followed the study of this subject with great zeal, passing continuously from one plan to another, as each was found to possess faults which lead to confusion in results. He has spent some time with me occasionally for several years past, and done more or less experimental work in my laboratory. In conversation it was suggested that steel be tried as a material in which to make test fillings. Following this idea, the Wedelstaedt test-tube was developed, and, simple as it is, it seems to have opened up new possibilities in this field of work. Tempered steel is a very stable material, suffering change of bulk only from thermal changes, the amount of which is definitely known. Dr. W.'s idea was to form a large circular cavity in a piece of steel, such as could be placed on the stage of the microscope for the study of the cavity-margins after filling with amalgam.

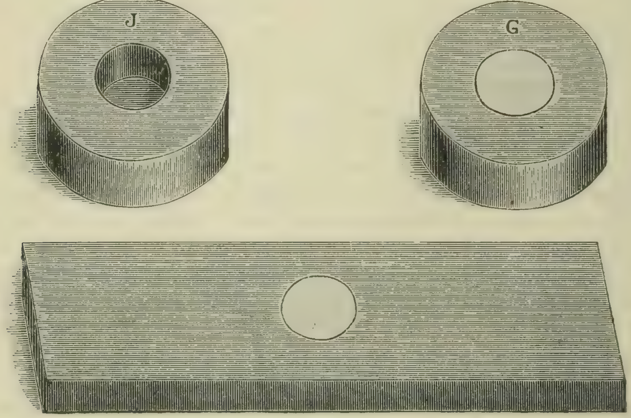
After an extended series of studies by this method, Dr. Wedelstaedt reported to me that he found a large proportion of the amalgams in the market contracted sufficiently to form a clearly visible gap around a portion or the whole circumference of the margin. Although closely engaged in other experimental work, I at once ordered some of the tubes made, to see for myself what promise they gave of solving these questions. After the study of a few specimens, I became convinced that the plan offered great advantages. I found that a shrinkage of one ten-thousandth of an inch became appreciable with a half-inch lens of medium aperture, if used with the binocular stand to eliminate the confusion of focus likely to occur from slight irregularity in the height of the finish of the margin of amalgam.

I therefore made a study of the forms of tubes and steel slides, in order to obtain the best for the combined study of the shrinkage from the margins by means of the microscope, and for the measurement of the contraction and expansion of the mass as a whole by some form of micrometer yet to be devised. After considerable study of steel slides with a cavity in the center (Fig. 11), these were abandoned as being not so good in either case as the tubes. The important points were that the tubes offered simpler plans of delicate measurement with a micrometer, and, by arranging a suitable holder on the stage of the microscope, they could be easily rotated so that every part of the margin could be brought under the lens in the same angle of light. This latter I found to be very important in the detection of slight breaks along the margin, and also in the measurement of the width of the gap formed between the amalgam and the margin of the cavity with the eye-piece micrometer. The stage tube-holder consists simply of a metallic slide which has two short posts set just far enough apart so that a tube will not quite pass between them. Then, with the microscope at an angle of thirty or forty degrees, the tube rests against the posts, rotates easily and smoothly, and every tube is a perfect fit, even if not turned closer than a hundredth of an inch to gauge.

These points determined, plans were made for making the most perfect tubes possible to the men and machinery at my command. The size chosen was one inch outside diameter, by one-half inch outside length (Fig. 11). The cavity is circular, three-eighths of an inch, or, more exactly, thirty-eight-hundredths of an inch, in diameter, the depth being the same as the diameter. The walls of the cavity were ground perfectly smooth, except a band at the bottom about a twentieth of an inch in width, which was left rough to prevent pulling up from the bottom in case a filling should shrink. The face of the tube was ground perfectly flat on a hone. The tube was then hardened and the face and walls of the hole reground, and the outside surface repolished. Finally, the tubes were tempered to a light orange and the edge of the hole perfected by regrinding. The object was to obtain a perfect margin for microscopic study, and one to which a filling could be finished without marring its perfect edge.

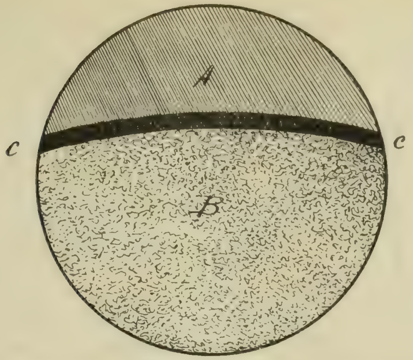
In the study of amalgam fillings in these tubes by aid of the binocular microscope, what appeared to be enormous contraction occurred, amounting to as much as two-thousandths of an inch in extreme cases, as determined by the eye-piece micrometer. (See Figs. 12, 13, and 14.) At the same time the margin of the filling, originally finished flush, sunk below the margin of the tube so far that even with the binocular instrument both the margin of the cavity and the margin of the amalgam could not be seen in the same focus. Every grade between this and perfect margins was observed. In many instances fillings were observed to present the appearance of being tilted to one side, so that, while there was a wide opening on the one side, the margin was reasonably close on the other. In other cases, again, the contraction seemed to be very irregular, some parts of the margin remaining close, while openings occurred in spots or in short sections ; or, again, the opening would be very irregular in width. Some idea of the appearances will be given by the illustrations presented, and especially of the fact that by this mode of observation no difficulty is experienced in determining that an opening of the margin has occurred.

Fig. 11.



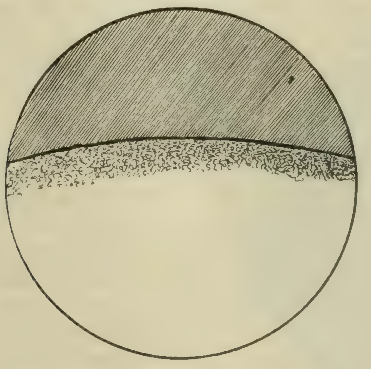
The Wedelstaedt steel test-tube, and one steel slide for the microscope. (Full size.) These are used for testing amalgam for shrinkage and expansion, using the microscope for the examination. The Wedelstaedt test-tubes are of hardened steel one-half inch deep, and one inch in diameter, with a cavity three-eighths of an inch in diameter and one-fourth inch deep. The face or top of the tube is ground flat on a hone, and the margin of the cavity brought to a perfect edge. They are so arranged as to place them on the stage of the microscope and rotate them so as to bring every part of the margin of the cavity under the lens in the same relation to the angle of the rays of light chosen for the examination. One of the test-tubes is filled with amalgam, the other is empty. The steel slide is filled with amalgam.

FIG. 12.



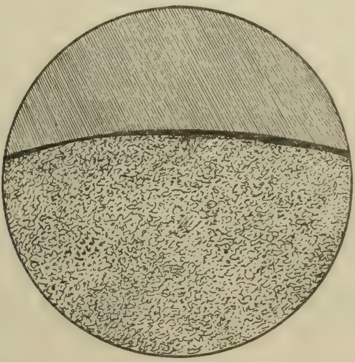
The microscopic appearance of the broadest opening of the margin between the amalgam filling and cavity-wall observed. *A*, the cavity-wall or face of the steel tube; *B*, the amalgam filling; *c*, *c*, the line of separation, two-thousandths of an inch in width, between the amalgam and the cavity-wall. Reduced in size two-thirds.

FIG. 13.



Microscopic appearance of a line of separation of amalgam filling from cavity-wall, five-thousandths of an inch wide. Reduced in size two-thirds.

FIG. 14.



Appearance of line of separation of filling from cavity-wall in irregular contraction of [the amalgam. Reduced in size two-thirds.

FIG. 15.

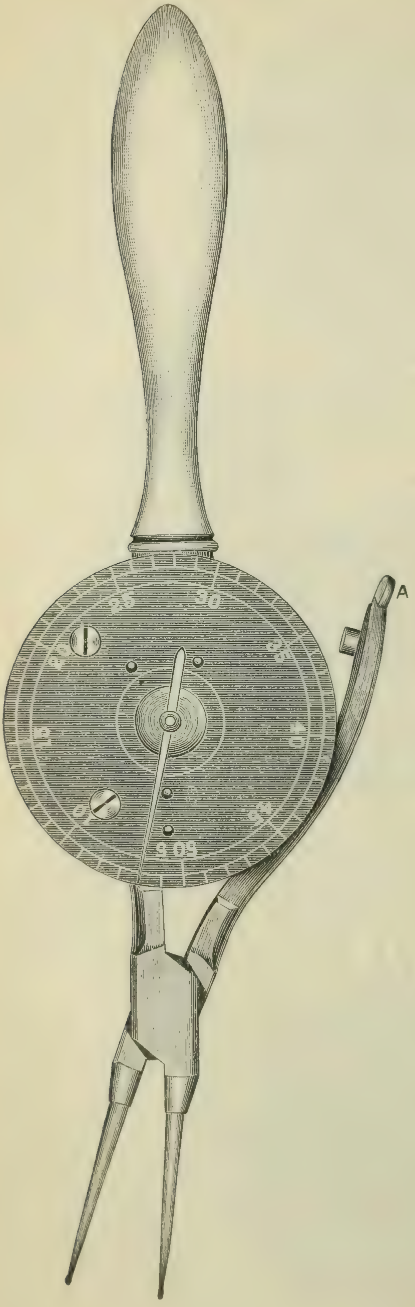


FIG. 15. *A cavity micrometer.* (Full size.) An instrument for the accurate measurement of cavities in the teeth for determining the area of exposure to the stress of mastication, and for determining the area of *the seats* of fillings; or the area of that portion of the cavity which must carry the stress placed on the filling. The points of the instrument are bent at an angle of forty-five degrees, which could not be well shown in the photograph. In use the thumb is placed on the thumb-piece (A), and the points closed. The points are then placed in the cavity in the position desired, and the thumb-piece released. A light spring carries the points against the opposing walls of the cavity, and the index needle shows the measurement in hundredths of an inch.

Now, the old idea of the tendency of amalgams to assume the globular form and thus pull away from the margins and pile up in the center was forced up for further consideration. I have explained the principles involved in what has become known as the spheroiding of amalgams in the July issue of the DENTAL COSMOS, and need only to refer to this one phase of the question here. I found that the margins of the amalgam remained sharp, which did not look like pulling away in the effort to assume the rounded form; and microscopic and macroscopic examination revealed no rise of the central portion of the mass, but strongly suggested the opposite movement. It became necessary now to determine this definitely. Taking the measurements made by the use of the eye-piece micrometer as a guide to the necessary minuteness of the measurements that would probably be required, a formula was made out for a micrometer that would work to one-ten-thousandth of an inch, the design requiring that all of the gearing for the multiplication of movement be made by chains and pulleys instead of cog-wheels, which are usually employed. The micrometer itself offered little difficulty; but the question as to how to handle the tubes so as to get them to the instrument precisely in the same position at each measurement was different. It is easy enough to arrange a micrometer that will accurately measure the journal of a watch-wheel or any delicate object of definite form ; but the measurement of differences in bulk occurring in objects of considerable size is quite another matter, and requires the most positive precision in placing them to the instrument at each successive measurement precisely as when first measured, or that they remain in the position of the first measurement until the last is taken. For the multitude of measurements contemplated the latter was impossible, and replacement must be accomplished. The manner of doing this will be sufficiently understood by a study of the illustrations of the micrometer, together with its description (Figs 16 and 17).

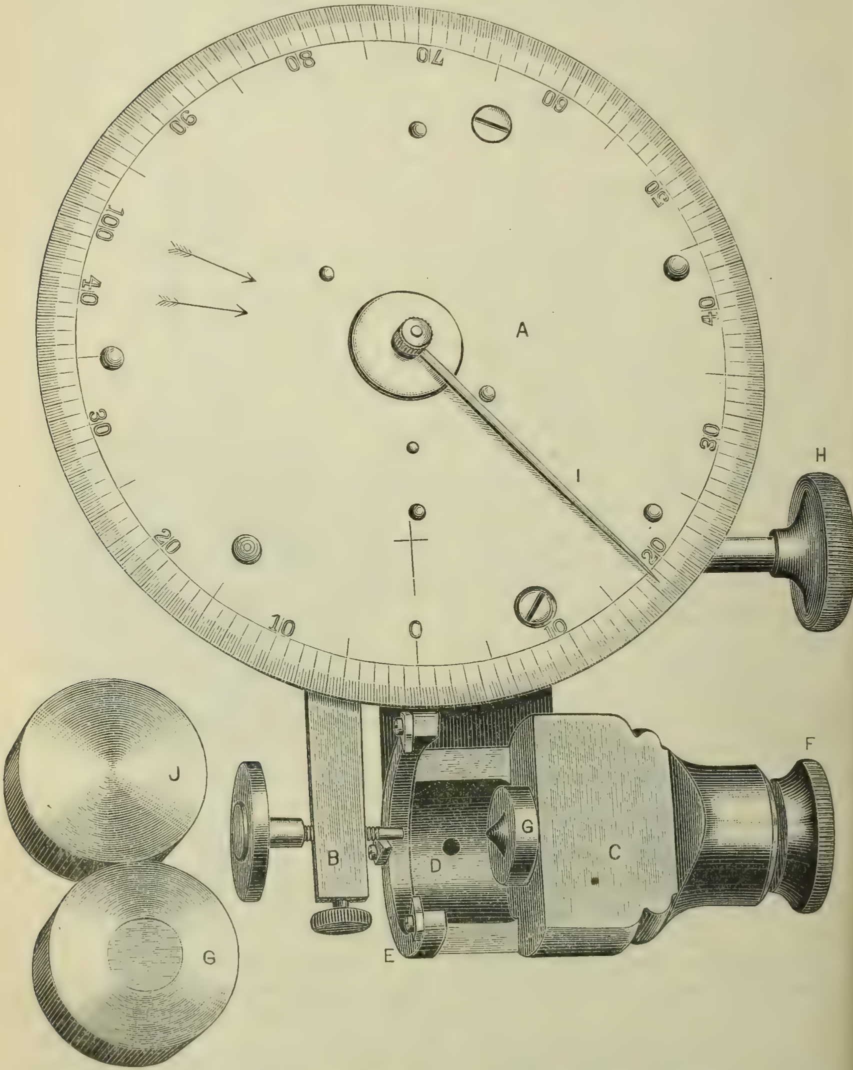
It should be observed that, in the arrangement for holding the tubes, all measurements are taken from the face of the tube, and that any inaccuracies in the length or breadth of the tubes do not affect the accuracy of the measurements in any degree. Even inaccuracies in the facing of the tubes are eliminated by turning the tubes always to one position. Further, it should be noted that the effects of thermal changes are also nearly completely eliminated from the measurements, for, as the measurement is from the face of the steel, its contraction or expansion is of no effect whatever, and there is left to be accounted for only the difference between the expansion, in case of rise of temperature, of the amalgam and the expansion of the steel. As the expansion of the amalgam is more than the expansion of the steel, the amalgam would show upon measurement less than its true expansion the amount of the enlargement of the cavity by the expansion of the steel. Calculations from known data have shown that within the range of temperature in which I have worked this difference is too small to be appreciated with the instruments employed. It has therefore been ignored.

When this instrument was built, it was the intention to mark the touch of its contact-point with the amalgam by the electric current, in order to prevent pressure on the amalgam and to render the instrument more accurate. After a trial, however, it was found accurate, with the proper precautions in using so delicate an instrument, fully to the limit of its scale, even when read with a two-inch lens, so that nothing could be gained in this direction by the use of the current.

After a trial, a difficulty presented itself in that it was found that the amalgam, in the process of setting, threw up crystals on its surface that caused a derangement of the measurements, making an apparent expansion. This was overcome by fixing a thin bit of steel, one-hundredth of an inch thick and a tenth of an inch square, in the surface of the filling while finishing it, and making the contact on that. This also prevented the danger of the contact-point of the instrument sinking into the surface of the amalgam at the first measurement while it was still soft. The danger from pressure on the amalgam has been held constantly in view, though the contact of the instrument is very light. In practice this contact need only be momentary. The glass having been fixed for its accurate reading, the contact is made and immediately lifted. This has been made the rule of all of the measurements, whether the amalgam was soft or hard.

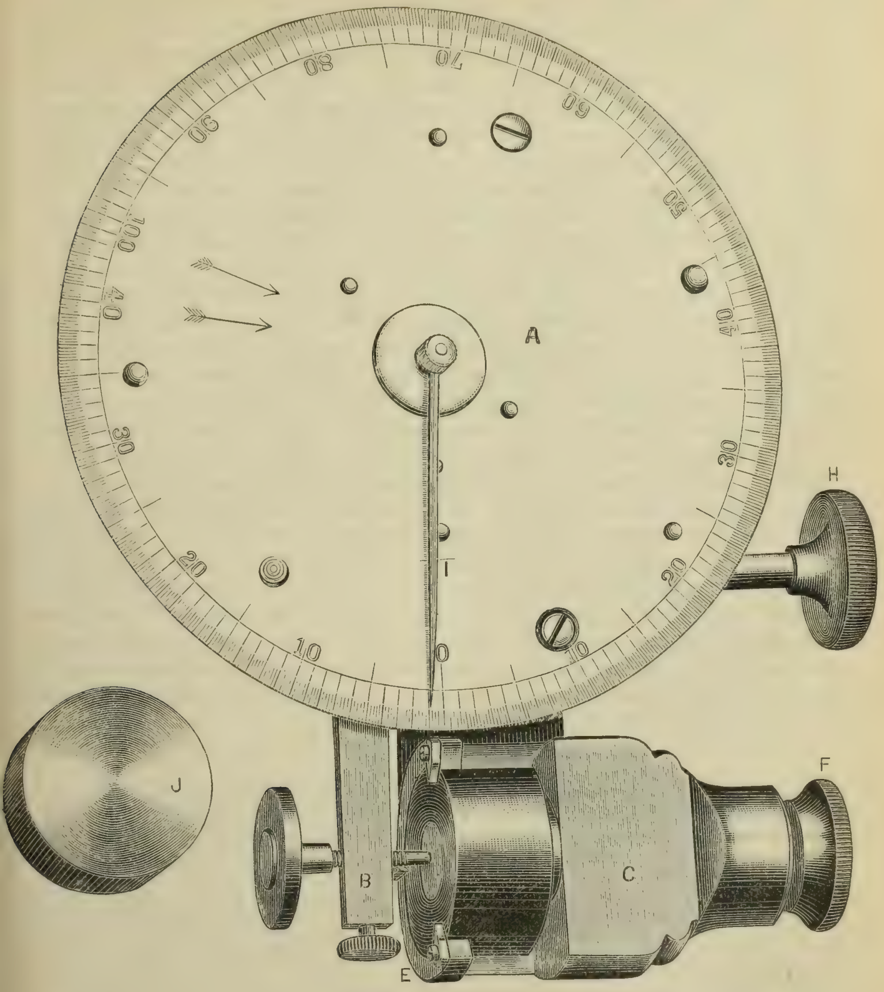
Measurements with this instrument showed that whenever there was parting of the amalgam from the margins of the cavity that could be appreciated by microscopic examination, there was also sinking of the amalgam in the central part of the filling. This amounts to a demonstration that the pulling away from the margins of the cavity is on account of contraction purely, not from a tendency to ball up or spheroid. The micrometer does even more than

FIG. 16.



*A special micrometer for the measurement of the contraction and expansion of experimental amalgam fillings.*—A is the dial-plate of a micrometer. The figures on the dial represent thousandths of an inch. For the more accurate reading of results the instrument has a swinging lens which is not shown. This instrument was constructed especially for the measurement of the contraction and expansion of amalgam fillings in the Wedelstaedt test-tubes; and a principal point arrived at is the replacing on the tube in the exact position in which it was first measured as often as desired. Fig. 16 represents the instrument open, and Fig. 17 represents it with a tube filled with amalgam in position for measurement. B is a bar holding the contact point, C is the tube holder. This tube holder has a trough at D, which is slightly too concave for a tube to fit at its bottom, so that every tube rests steadily on its margins, the

FIG. 17.



tubes being turned as closely as possible to gauge. A ring with its upper third cut away, E, guards the open end of this trough, and is just large enough to admit a tube easily; and on the outer face of this ring three steel lugs are fixed equidistant apart, which prevents a tube from being pushed through. When the test-tube is placed in the trough it is slipped forward into the ring and lies steadily; then by turning back the milled head, F, a pointed plunger, G, is driven out by a coiled spring and drives the tube firmly against the three lugs that prevent its passing through the ring E. Each tube has a fine mark on its circumference; and now it is turned until this is just even with the cut end of the segment of the ring E, and it is then in position for measurement. It may be removed and replaced in exact position as often as desired.

By turning up the milled head H, the index needle is pushed to the right, and the contact point B raised. By turning it in the opposite direction the needle is allowed to swing back until the contact point touches the object to be measured, when it stops.

J is a face plate, or blank, for setting the instrument at zero; and for testing its accuracy from time to time while using it, as a check against possible derangement or inaccuracy.

It will be seen that all measurements are made from the face of the tube, which is ground to a plane surface. If a filling sinks into the tube, the amount of shrinkage is measured as below zero. If it rises above the surface of the tube, it expands, and is measured as above zero. It is not necessary, however, that the filling be finished exactly to zero, as the measurement can be taken considerably above or below the plane just as well. The test-tubes, in addition to being ground flat on the face, have the walls of the cavity ground perfectly smooth and parallel, except the portion just near the bottom, which is left rough to hold this portion of the filling firmly in case of shrinkage.

this, for it detects contraction at the central part of the mass before any breaking away from the margins can be detected by the microscope, generally by one or two ten-thousandths of an inch. As a gap of one ten-thousandth of an inch can be seen readily with a good half-inch lens, a tendency to cling to the margins rather than to pull away is shown. However, I have in no case discovered a contraction of as much as three ten-thousandths of an inch without finding also a decided break of the margins with the microscope, and generally the rupture of the margins becomes apparent when the micrometer shows a contraction of two ten-thousandths of an inch. Thus the two instruments supplement each other, and also form a check upon each other as well.

The width of the rupture of the margins may be measured with the ordinary eye-piece micrometer of the microscope with a fair degree of accuracy. It is not so easy, however, to work with the eye-piece micrometer over opaque objects as over transparent ones, and I have found the special micrometer much more reliable for the measurement of contraction than the eye-piece micrometer, and for the measurement of expansion it must be relied upon entirely. Therefore all of my tabular charts will be made from the measurements of that instrument.

For examination with these instruments, I have chosen, so far as practicable, the same formulæ used for the study of the strength of the silver-tin amalgams presented in last month's issue of the Cosmos. The numbers are also the same, except in one case in which I failed to obtain a sufficient amount of the material. I have also added a few other formulæ, especially those containing a larger proportion of silver. These have been made especially for this study by Dr. P. J. Kester, of Chicago, to whom I am under obligations for this very valuable assistance.

### The Exhibit.

I have chosen the graphic plan of presenting the contraction and expansion of amalgams. On entering the study of the exhibit, the reader will find first, upon the left, under the heading "Notes," a concise statement of the manner of putting in each filling. Under the statement, "Hand-Pressure," the filling was put in with such forcible hand-pressure as would be admissible in filling teeth, using a serrated point one-eighth of an inch in diameter, and drying out all free mercury thoroughly with a round rubber point which was a little smaller in diameter than the cavity, but completely filled it when pressure was applied. All of the fillings marked in this way were made as nearly alike as it was possible for me to do, and are intended particularly as comparative tests of the formulæ. In each one the packing and drying out was continued until the cavity was considerably over full. It was then trimmed level with the margin, and the steel disk, on which to make the contact in the measurements, was pressed into its surface. Then more amalgam was built around the disk and over the whole surface, and it was again trimmed level with the margins, and finally polished with the finger and lightly with the burnisher, alternately, until the microscope showed a perfect margin. The first measurement was then made.

Those marked "burnished in" were made with a ball burnisher, one-tenth inch in diameter, and, unless otherwise noted, all free mercury was dried out with a rubber point. Except as otherwise noted, the force used was as much as would be permissible in filling teeth. When the statement is that all softened material was removed, the softened portions of amalgam were pushed out with the instrument used in filling and discarded. But when the statement is that softened material was *cut away*, it was removed thoroughly with a sharp, broad, spoon-shaped excavator.

"Soft fillings" were made without wringing out the excess of mercury. The filling was made of the soft, plastic mass, just as it was from the kneading in the hand or in the mortar. Other notes regarding particular fillings will be found.

In italics I have noted the condition of the margin of each filling, as seen with the microscope after the limit of contraction had been reached.

Next to the right are the numbers of the formulæ, each followed by its formula and the per cent. of mercury in the mass of which each filling was made. It would have been possible to have collected the mercury expressed in filling, and the residue of the mass, and to have determined the percentage of mercury actually remaining in the filling; but this was done in but one case, which will be noted later. Mixes made in the mortar and in the hand have been noted.

Following this is the presentation of the contraction and expansion of each filling, as recorded with the special micrometer, each observation extending over a period of from ten to twenty days. The perpendicular lines and spaces represent hours and days, as noted at the top of the page. Each horizontal line and space represents two ten-thousandths of an inch, and these are numbered in thousandths of an inch (the unit of measurement employed) on the left of the ruling. Note particularly that each line represents a ten-thousandth of an inch and each space a ten-thousandth of an inch, so that five lines with their spaces represent one-thousandth of an inch. The particular time of each measurement is noted by a circle. The first on the left is the zero for that filling. If, at the next measurement, the filling had contracted four ten-thousandths of an inch, the circle was placed two lines below the first and in the perpendicular space indicating the time of the observation. This plan was continued to the final observation, and then the circles were connected by lines drawn from the one to the other, showing the curves formed by the contraction and expansion.

This series of fillings has been made with as much care, especially in the packing of the amalgam, as I was capable of bestowing upon it. Indeed, some of my friends who have seen the progress of the work say that entirely too much care has been bestowed upon it to properly represent amalgam fillings. But my object has been to represent the capabilities of amalgam as a filling-material when used with the greatest care. The fillings are large, and the packing of so much amalgam evenly and perfectly consumed much time; and as the greater contraction is shown to occur during the first hour after the mix is made, the supposition is that the time elapsing between the time of the mix and the time of the completion of the filling and its measurement is an important item as to the amount of contraction shown. Therefore, the time when the mix was made was taken, and the time of the first measurement after the completion of the filling. This is represented by figures in brackets representing minutes. I am sorry to say that a few failures to note the time occurred.

## Exhibit of Contraction and Expansion of Amalgams.

| NOTES. | No. | FORMULÆ. | Per Cent. of Mercury. | How Mixed. |
|---|---|---|---|---|
| Hand-pressure.......... (Time 40 minutes.) *Margins perfect.* | 1 | Silver 65<br>Tin 35 | 44.60 | Hand. |
| Hand-pressure (60) .......... *Margins appear perfect.* | 2 | Silver 60<br>Tin 40 | 37.85 | Hand. |
| Hand-pressure (60).......... *Margins open irregularly, width from o to 1.2..........* | 3 | Silver 42.45<br>Tin 57.55 | 37.27 | Hand. |
| Burnished in, removing all softened material (45).......... *Margin open, .4 to 1.2.* | " | Do. | 45.31 | Mortar. |
| Hand-pressure (50).......... *Margin open around two-thirds of circumference, .o to .6.* | 4 | Silver 55<br>Tin 40<br>Copper 5 | 39.70 | Hand. |
| Burnished in, removing all soft material (60).......... *Margins open all round, .2 to .4.* | " | Do. | 38.75 | Mortar. |
| Hand-pressure, with all the force I was able to exert (50), and cutting out all softened material.......... *Margins perfect.* | " | Do. | 39 70 | Hand. |
| Moderate mallet-pressure, drying out with rubber point (45).......... *Margins open all around, .4.* | " | Do. | 42.74 | .......... |

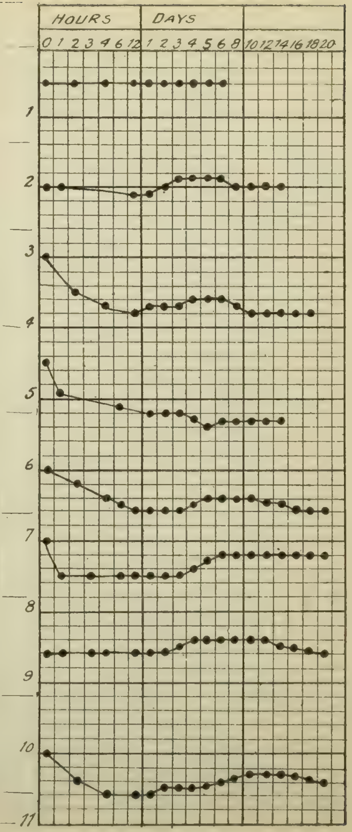
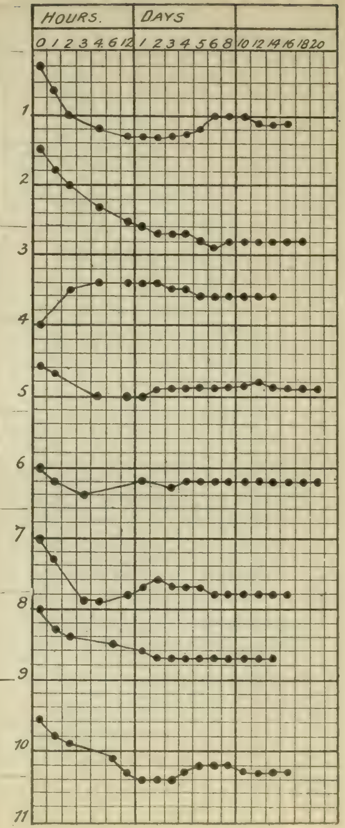


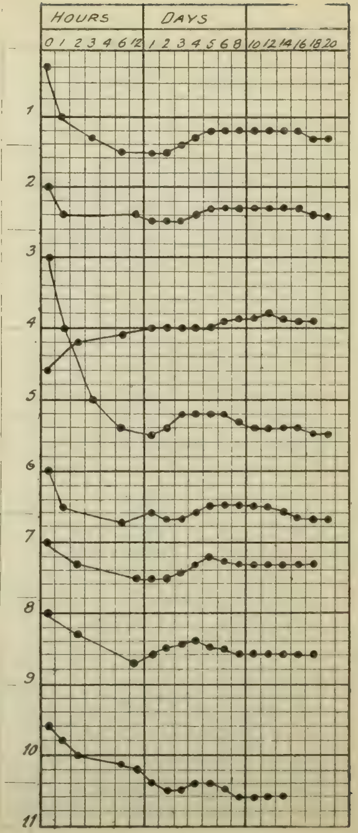
EXHIBIT OF CONTRACTION AND EXPANSION OF AMALGAMS.

| NOTES. | No. | FORMULÆ. | PER CENT. OF MERCURY. | HOW MIXED. |
|---|---|---|---|---|
| Hand-pressure (43) …………… *Margins open, .2 to .8.* | 5 | Silver 53.22<br>Tin 45 88<br>Copper .45<br>Bismuth .45 | 41.08 | Hand. |
| Soft filling (15) …………… *Margins open very irregularly, .4 to .10.* | " | Do. | 50 | Hand. |
| Pressed in with dynamometer (45) with a stress of 200 lbs…… *Margins slightly raised.* | " | Do. | 32.39 | Mortar. |
| Hand-pressure (40) …………… *Margin open .2 to .3 all around.* | 6 | Silver 48<br>Tin 48<br>Gold 4 | 36.50 | Hand. |
| Mallet-pressure (30) …………… *Margin open slightly half-way around.* | " | Do. | 37 65 | Hand. |
| Hand-pressure …………… *Margin open irregularly from .0 to .8.* | 7 | Silver 60<br>Tin 37<br>Gold 3 | 34.24 | Hand. |
| Hand-pressure (50) …………… *Margin open all around from .2 to .6.* | 8 | Silver 48.5<br>Tin 48.5<br>Platinum 3.0 | 35.02 | Hand. |
| Hand-pressure (35) …………… *Margin open all around from .3 to .8.* | 9 | Silver 44.81<br>Tin 52.78<br>Gold 1.78<br>Platinum .62 | 39.18 | Hand. |



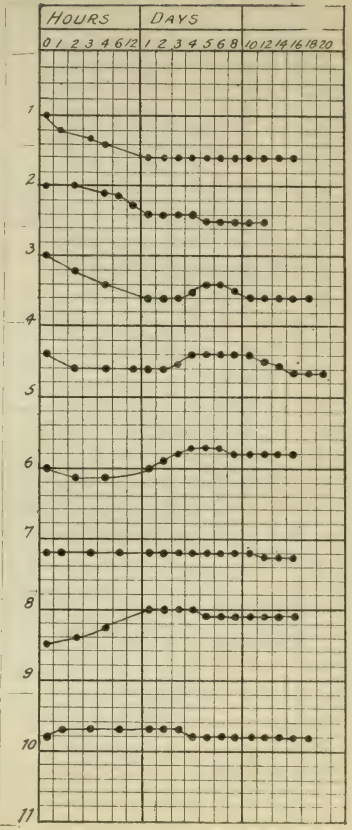
## EXHIBIT OF CONTRACTION AND EXPANSION OF AMALGAMS.

| NOTES. | No. | FORMULÆ. | PER CENT. OF MERCURY. | HOW MIXED. |
|---|---|---|---|---|
| Hand-pressure (3)..................................<br>*Margins open from .3 to 1.2.* | 10 | Silver 54.86<br>Tin 44.89<br>Zinc .25 | 32.05 | Hand. |
| Burnished in with extraordinary force and removed all softened material.<br>*Margin open half-way around.* | " | Do. | 39.54 | Mortar. |
| Filled quickly and lightly (25) by hand-pressure, removing no mercury......<br>*Margin open all around, 2.0.* | " | Do. | 41.51 | Hand. |
| Pressed in with 500 lbs stress with dynamometer.........................................<br>*Margin slightly raised.* | " | Do. | 30.84 | Hand. |
| Hand-pressure..........................................<br>*Margin open .1 to 1.0; the filling seemed to be tilted to one side.* | 11 | Silver 54.86<br>Tin 44.69<br>Zinc .25<br>Palladium .25 | 43.54 | Hand. |
| Burnished in, removing (50) softened material.............. ... ......................<br>*Margin open .0 to .6* | " | Do. | 40.88 | Mortar. |
| Hand-pressure (40)........... .....................<br>*Margin open all around, .2 to .5.* | 12 | Silver 41.92<br>Tin 56.33<br>Platinum .44<br>Zinc .88<br>Bismuth .44 | 41.73 | Hand. |
| Soft filling (13).........................................<br>*Margin very bad. Open all around. Widest points 1.5.* | " | Do. | 50 | Hand. |



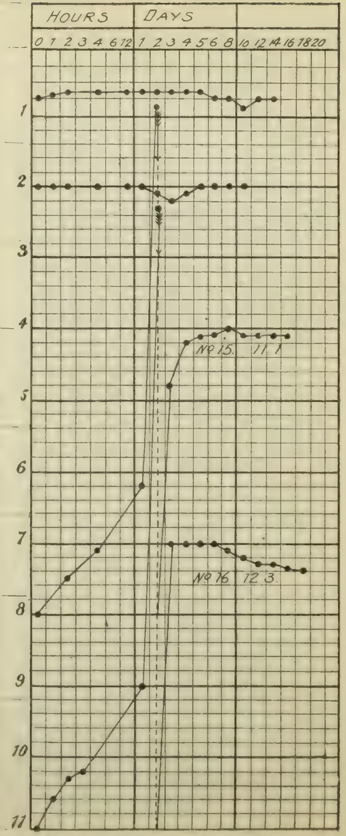
## EXHIBIT OF CONTRACTION AND EXPANSION OF AMALGAMS.

| NOTES. | No. | FORMULÆ. | PER CENT. OF MERCURY. | HOW MIXED. |
|---|---|---|---|---|
| The mass was laid aside (85) for one hour and the filling then made by hand-pressure.........................<br>*Margin open .1 to .5.* | 12 | Silver 41.92<br>Tin 56.33<br>Platinum .44<br>Zinc .88<br>Bismuth .44 | 50 | Mortar. |
| Burnished in. Material (45) very dry and crumbling...................................<br>*Margin open .1 to .4.* | " | Do. | 33.48 | Hand. |
| Hand-pressure (55)...................................<br>*Margin open irregularly, .8 in widest point.* | 13 | Silver 47.06<br>Tin 51.76<br>Copper .94<br>Zinc .24 | 43.18 | Hand. |
| Put in with the fingers..........................<br>*Margins very bad and do not agree with micrometer, open 1.0 in several places.* | " | Do. | 50 | Hand. |
| Hand-pressure (65)...............................<br>*Margins perfect.* | 14 | Silver 42.83<br>Tin 51.62<br>Copper 4.65<br>Aluminum .55<br>Gold .01 | 46.70 | Hand. |
| Hand-pressure.—This mix formed a dark semi-coherent mass that was difficult to pack...................................<br>*Margins perfect.* | 17 | Silver 65<br>Tin 30<br>Copper 5 | 50 | Mortar. |
| Burnished in. No mercury (30) could be removed....................................<br>*Margins appear good.* | " | Do. | 56.15 | Hand. |
| Hand-pressure (40)................................<br>*Perfect margins.* | 18 | Silver 70<br>Tin 30 | 46.36 | Hand. |



## EXHIBIT OF CONTRACTION AND EXPANSION OF AMALGAMS.

| NOTES. | No. | FORMULÆ. | PER CENT. OF MERCURY. | HOW MIXED. |
|---|---|---|---|---|
| Burnished in, cutting (45) out and removing all softened material……….<br>*Margins good.* | 19 | Silver 47.5<br>Tin 47.5<br>Copper 5.0 | 41.69 | Hand. |
| Hand-pressure, cutting (50) out and removing softened material…………<br>*Margins perfect.* | " | Do. | 38.86 | Hand. |
| Hand-pressure. ……………………… …………<br>*Margins much raised, with spherical surface spheroided, 11.1.* | 15 | Silver 80<br>Tin 20 | 60 | Mortar. |
| Hand-pressure ……………… ……………<br>*Spheroided, 12.3.* | 16 | Silver 75<br>Tin 20<br>Copper 5 | 56.56 | Hand. |



## THE CONDITIONS OF THE CONTRACTION AND EXPANSION OF AMALGAMS.

The contraction or expansion of amalgams seems to depend on many factors.

First. The components of the alloy.

Second. The fineness of the cut of the alloy.

Third. The percentage of mercury.

Fourth. The manner of the mix.

Fifth. The mode of manipulation.

If the reader will take the pains to select out and study the curves of contraction and expansion in the *hand-pressure* fillings, he will find a remarkable uniformity in the curves formed in all of the alloys with less than sixty per cent. of silver in the absence of copper. The different proportions of silver and tin present differences in the extent of the curves or the amount of contraction, but the curves have the same general form. As these fillings were made (including the whole number) one, two, and, rarely, four per day, and measured at the dates indicated, following the date of each filling, no instrumental error can in anywise account for these curves. Contraction occurs during the first twenty-four hours, being much the greatest in the first two hours. This may be called the primary change. Then a slight compensating expansion occurs, varying in time from one to three days. Comparative tests have shown that the amalgam softens materially during this expansion, as noted in the last month's issue of the COSMOS. But this series of experiments shows this expansion to be much more general than I had supposed when last month's paper was written. It must be regarded as normal to the silver-tin amalgams, containing less than sixty per cent. of silver, as its absence is the exception, and can generally be accounted for by some peculiarity in the manipulation. After this expansion, there is generally some slight contraction which seems to complete the movement. Of this, however, we have no certain information, as the greatest length of time these observations have been consecutively followed is now only about thirty days. What the remote changes may be would be mere guess-work, but clinical observation leads me to anticipate that a very slow change of bulk will be found to continue for a long time.

After reaching the proportion of sixty per cent. of silver, the curve of primary contraction disappears, and, as it seems to me, rather suddenly. If there is a small percentage of copper, the straight line occurs with a less proportion of silver. However, so many of the alloys that contain between fifty and sixty per cent. of silver contain other metals, as gold, platinum, zinc, etc., and are so differently cut, that it is difficult to form an estimate of the contraction of the pure silver-tin formulæ within that range. Formula No. 4, with fifty-five per cent. of silver and five per cent. of copper, has contracted badly, serving to throw estimates of the value of copper, in the prevention of contraction, into confusion. However, this is, in a measure, explained by differences in the cut of the alloy.

In alloys that contain more than sixty per cent. of silver we find no primary contraction, but when we pass on to eighty per cent. of silver to twenty per cent. of tin, an immense expansion suddenly appears, and which is in nowise relieved by the substitution of five per cent. of copper for an equal amount of silver. This expansion appears all the greater for the reason that by the confinement of the mass by the walls of the cavity, all of the increase in bulk is thrown upward with a rounded surface. The amalgam spheroids. If we could measure contraction in the same way, some of the other formulæ, those containing a low percentage of silver, would show even a greater change of bulk.

So far as I am now able to determine, the addition of small quantities of other metals, except it is copper, to the silver-tin alloys has little or no influence on the contraction or expansion of the amalgams. Certainly no tendency is shown toward the control of contraction. It has been claimed that gold had this influence,* but no such influence has been manifest in the proportions used in these formulæ. The tendency of this metal to make the amalgam softer renders a larger proportion inadmissible. What may be the influence of the addition of small percentages of gold, platinum, zinc, or other metals in whitening the amalgam or in causing it to retain its color, when placed in the teeth as fillings, has not been a subject of inquiry in this investigation.

## Fineness of the Cut of Alloys.

I have been unable to find any exact expression of what I have seen of the influence of the fineness of the cut of alloys upon the contraction of the mass produced. It is, however, the principal cause of the confusion that occurs in the contraction of the different alloys ranging between fifty and sixty per cent. of silver. An alloy cut in very fine shavings, or comminuted into very fine particles, has always contracted much more than a similar grade of alloy cut in moderately coarse filings. For instance, formula No. 7, with sixty per cent. of silver and cut in very fine shavings, contracts much more than formula No. 6, with forty-eight per cent. of silver and cut in moderately coarse filings. This kind of difference has been noted continuously as belonging to the grade of the cut of the alloys. The cut in medium coarse filings—not so coarse as to seriously interfere with making a reasonably smooth mass—makes a much stronger amalgam, and one that contracts less with a given percentage of silver below sixty per cent. than if cut very fine. I admire the skill displayed in the magnificent velvety fineness of the cut of many of our modern alloys. There is no doubt but that it imparts to them very captivating working properties so far as the manipulation in the mixing and with the instrument is concerned. But it causes them to take up more mercury, the resulting amalgam is softer, and they contract more. The reasons for these differences given in last month's DENTAL COSMOS seem to me to be correct.

*The percentage of mercury* has not seemed to be so large a factor in the contraction of amalgams as I had supposed; and yet, when the mass has been worked very dry, the change of bulk has been markedly less, whether contraction or expansion. Soft fillings, or fillings made from a mass containing fifty per cent. of mercury or more that have not been wrung out, have shown great irregularity in contraction, giving a margin that opens very wide at some points and but little at others, and has a peculiarly ragged appearance. In one case—the second filling of formula No. 13, put in with the fingers—the contraction shown by the micrometer does not agree at all with the microscopic appearance. The margin is very bad indeed, being open a full thousandth of an inch in many places, while the micrometer shows only two ten-thousandths of an inch contraction. In this case I suppose that the filling has pulled up from the bottom of the cavity. In cases of fairly good working masses that have been well wrung out, not so dry as to be very difficult to pack, and yet not soft and plastic, differences of five per cent., or even more, in the mercury do not seem to have much effect. But whenever the mass becomes so dry that no mercury can be worked to the surface in the process of packing, there is a marked lessening of the contraction. This seems to be more on account of differences attending the manipulation than on account of the difference in the amount of mercury, as the same thing occurs when the amalgam has been allowed to stand until it has so far set as to work dry.

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*J. Foster Flagg. "Plastics and Plastic Filling."

*The percentage of mercury required* by the different alloys to make a suitable mass for filling is quite different, and especially there is a very notable increase in the amount required, as the percentage of silver is increased soon after passing sixty per cent. This increase is not very notable with sixty-five per cent. of silver, but with seventy per cent. it becomes very difficult to form a workable mass with fifty per cent. of mercury, while with eighty per cent. of silver it becomes necessary to use as much as sixty per cent. of mercury. The disposition to expand becomes notable in connection with this increase in the amount of mercury required. An increase in the amount of mercury required is also noted in descending the scale of the percentage of silver in the range below sixty per cent., though this increase is much less marked. It seems from careful observation on this point that a good working mass can be made with less mercury at about sixty per cent. of silver than with any other proportion.

As noted in last month's paper, a good mass may be made of any of the alloys, with less mercury remaining in it when ready for use, by first kneading it with an excess and then wringing it out than by any attempt to use a low per cent. of mercury without wringing out. Wringing has an effect to improve the mass both in its working qualities and in the stability of the final product, independently of the removal of an excess of mercury, especially if the wringing is maintained for a little time. This is true when the mass is so dry that no mercury can be removed from it. I suppose the reason for this is that the steady compression of the whole mass serves to equalize the distribution of the mercury. It is certain that I have never been able to make a filling of good strength or of good appearance of margins on microscopic examination without at least an attempt having been made to wring out the excess of mercury.

The mercury that I have used in test fillings, both for the trial of strength and for shrinkage and expansion, is supposed to be chemically pure, though no examination has been made. All of it has come from the same bottle, so that, at least, it has been the same for all of the alloys.

The influence of mixing by grinding in a mortar has not been very thoroughly tried in this series of fillings. I have recorded a number of mortar mixes, but they have not been very thoroughly triturated. The amount of material required in these fillings has made it difficult to grind them well in the small mortars. So far as tried, the difference has not seemed important, but from other considerations, which will presently appear, I should expect that severe grinding in a wedgwood or roughened glass mortar would considerably increase the contraction.

## Influence of Manipulation.

It is a difficult matter to properly represent the influence of differences in manipulation of amalgam on its contraction or expansion. Much of my knowledge of this has been gained from a study of the cases presented, and from special fillings made since this series was completed. It must be understood that of all of the elements, the metals are the most sensitive to impressions that fall short of chemical molecular changes. Also, that there are probable combinations that are not yet definitely known. It is often impossible to know what has changed the behavior of a metal or a metallic compound, but in all of the experimental work upon the metals, uncertainty as to the exact behavior under given conditions is forced upon us continually. The contraction and expansion of amalgams is no exception to this rule.

There are, however, certain results from the influence of manipulation upon the contraction and expansion of amalgams that have become so definite in the experiments recently made that I am able to reproduce them at will and with certainty. Yet to do this so that the differences stand out prominently, it seems necessary to go out of the order of manipulation applicable in the filling of teeth in the mouth. This is permissible in the illustration of the nature of the material.

In the July issue of the Cosmos, I described the manner of filling cavities in making blocks for testing the crushing stress and the flow of amalgams. One of these plans, and that which has always produced the strongest product, was to fill with flat, serrated points, using a comparatively light pressure, continued for some seconds at each thrust, being careful to develop no free mercury. When I came to the filling of the great cavities prepared for the tests of expansion and contraction, I found this plan totally inapplicable. Try as I would, I could not finish one of these fillings by this method. I would either go too fast and develop free mercury, or my mass would become so hard as to be useless before the filling was completed. I therefore made the fillings, using such changes in the form of manipulation as I could, but without any very marked effects on the results. The important feature of the effects of manipulation in the packing of amalgams is produced by the breaking up and kneading the mass into plasticity with the instrument. If it is forcibly ground up and softened with the instrument, it is caused to contract. It does not seem to make much difference how this is done, whether by rubbing with a burnisher or by thrust after thrust with a flat point. It is in vain that we dry out the excess of mercury by pressure or by absorbents; it will still contract if the proportion of silver is less than sixty per cent. Fillings must be condensed at any cost, and the material must be forced into all parts of the cavity. Any plan of manipulation that fails in these points is of no value in filling teeth.

Pressure, however severe, that condenses the mass without kneading it tends to prevent shrinkage ; and any of the amalgams can be made to expand in setting, even those that with ordinary manipulation contract the most, by using sufficient pressure that actually compresses the mass without breaking it up. This is illustrated in the fourth filling of formula No. 10, an alloy that is found to contract badly with the ordinary modes of manipulation, probably for the reason that it is cut excessively fine. This particular filling expanded. It was made in this wise : A steel point of a heavy dynamometer was made to fit loosely into the cavity of the steel tube to be filled. The cavity was partly filled, but loosely, with amalgam, and this steel point, cushioned with a piece of semi-soft rubber, was placed upon it and a stress of five hundred pounds turned on and maintained for ten minutes. Then another layer of amalgam was put in and compressed in the same way. This was continued until the cavity was full. This filling has expanded nearly as much as other fillings from this alloy have contracted. The mercury expressed in making this filling was carefully weighed and deducted, so that the percentage given in the exhibit is that actually remaining in the completed filling.

The third filling of formula No. 5—another alloy that contracts badly—was put in by thrusts of two hundred pounds each with a steel point one-fourth inch in diameter used in the phagodynamometer illustrated in the June issue of the DENTAL COSMOS, substituting these special points instead of the teeth. This filling has also expanded. It was intended to collect the mercury expressed in making this filling and deduct it from the percentage in the mass as prepared, but unfortunately some of it was lost.

The third filling from formula No. 4 was made by hand-pressure, using all the power I was able to exert, and very carefully cutting out with a sharp instrument and discarding all material that softened under the instrument,—*i.e.*, all material that became kneaded to softness was discarded entirely, not dried out and condensed. This filling has shown no contraction whatever, but expanded slightly at the usual time of the secondary change (expansion) occurring in other fillings made from this alloy. The margins of this filling have remained perfect. In making the fillings from formula No. 19, the softened material was also *cut out* and discarded. Their margins are good.

While these experiments illustrate the effects of manipulation, they give little hope that, in general operations upon the natural teeth, contraction can be prevented in those alloys containing less than sixty per cent. of silver.

As this experimental work proceeded, and the changes were watched from day to day, I began to wonder why some of these fillings that showed so much contraction by microscopic examination (they look very perfect to the naked eye) did not fall out of the cavities ; but they remain firm. It seemed to me certain that this contraction did not include the whole mass of the filling, and I began to cast about for the means of examining the filling more in detail. Finally, means of examining the lower end—the bottom of the filling—suggested itself. I had another set of tubes made of the same outside diameter as the Wedelstaedt tubes, but only one-fourth inch long, with the hole, or cavity, reaching entirely through. This cavity was of the same diameter as the others, and the entire walls were polished ; both ends of the tube were ground flat. These tubes were bolted to a flat, polished steel plate in such a way that they could be removed by turning a screw. While bolted down, they were filled with alloys that were known to contract, and immediately they were full they were removed from the plate and both ends of the filling finished in the same manner. The upper ends of the tubes were numbered, and the lower ends marked with letters, so that no mistake should be made. The upper ends of these fillings showed the same contraction as those in the Wedelstaedt tubes; *but the lower ends showed either very little or no contraction at all.*

In order to obtain a better understanding of the movements of the material, a steel disk for a contact-point for measurement with the micrometer was laid in the center of the bottom of the cavity and the amalgam packed over it, and another fixed in the upper end on completion of the filling, so that the movement at each end of the filling could be determined by measurement in the micrometer. A disk hollowed out on one side was used behind these in the tube-holder of the micrometer, so that its plunger need not mar the filling in clamping the tube in position for measurement.

Measurement of these showed that the upper end of the filling sunk down into the tube as the margins opened; but measurements of the lower end of the filling showed that, instead of sinking into the tube, *it bulged outward, producing a convex surface.* I will give the actual figures of the measurement of these movements in one case, which is typical of these experiments.

Hand mix from formula No. 13 of the exhibit; mercury 42.02 per cent. Made filling in cylinder 3C, placing disk of steel in the bottom and building over it; packed with serrated point and hand-pressure, removing all free mercury with rubber point. Filled over full, trimmed down and pressed steel disk into the surface, and built amalgam over the whole surface again. Removed cylinder from plate and finished both ends of filling, and made the first measurements. Time, fifty minutes.

| | | | | |
|---|---|---|---|---|
| First measurement: | upper surface, | + 1.4; | lower surface, | —0.2.* |
| After 2 hours, | " " | + 1.0 | " " | + 0.1. |
| " 6 " | " " | + 0.8 | " " | + 0.2. |
| " 24 " | " " | + 1.4 | " " | + 0.2. |

Total movement downward of upper surface, 0.9.
" " " " lower " 0.4.
Opening of margin of upper surface, 0.4 to 1.0.
" " " " lower " 0.0 to 0 2.

These measurements, which have now been repeated so many times as to seem well made out, and also to show a fair degree of uniformity, differing only with the alloy used and with the modes of handling, give such a view of the movements of the material in its contraction on setting that we may reasonably undertake to illustrate it diagrammatically. If we illustrate the form of the filling when first made by the solid lines in the accompanying diagram (Fig. 18), the form after contraction will be diagrammatically shown by the dotted lines. The last part of the amalgam placed in the cavity—that which has been worked the most with the instrument—contracts the most, and causes the filling to become warped out of its original shape. At the upper part of the filling the contraction draws the material away from the walls of the cavity, and the surface sinks downward. The material at the bottom of the filling that has been compressed by the instrument without being worked to softness refuses to contract in proportion, and by the contraction above it is caused to bend downward. This form is illustrated over and over in the contraction of gums, gutta-percha, and other substances dissolved to a semi-liquid state and allowed to dry up in bottles, in which position the upper portion dries the fastest and shrinks the most. There can be no doubt that this result is due directly to the difference in the amount of rekneaded material in the different parts of the filling. The difference would seem to be due to the greater contraction of the cementing substance formed by the solution of a portion of the alloy in the mercury, as suggested last month; and the more the mass is kneaded, the greater the proportion of this cementing subtstance.

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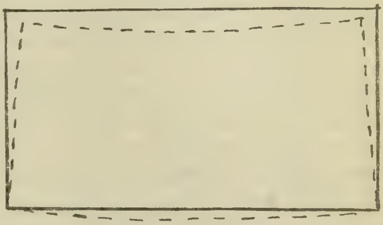
* The unit of measurement is one-thousandth of an inch.

Fig. 18.



Diagrammatic representation of the change in the form of an amalgam filling from contraction. The solid lines represent, in section, the form of the filling as made. The dotted lines represent the form after contraction has occurred.

Now, if we suppose that after the primary and secondary movements of change of bulk which we have studied are completed, there follows a much slower movement of contraction, lasting a long time, which seems already suggested in some of the fillings thirty days old, we can begin to understand how the margins of those broad, shallow fillings in the buccal surfaces of upper molars may be raised above the margins of the cavity by the *contraction* of the filling, instead of by a continuing expansion, as suggested last month. As the contraction and consequent warping proceeds, the central part of the lower surface becomes convex and lifts the margins of the filling.*

## PACKING AMALGAMS.

In the observation of the margins of the fillings of this series, irregularities in the parting at the margins were frequently noticed, and especially was this prominent in fillings made from preparations not wrung out. In several experiments undertaken for the purpose, it became clear that when the material was properly prepared, these irregularities resulted from irregularities in the packing. This was shown by marking certain points along the margins of tubes and depending on squeezing the amalgam up to the walls at such points by pressure in the neighborhood instead of packing it directly. In this way I found that I was able to produce gaps of shrinkage of extra width in fillings that seemed perfect when finished. It strikes me that this is an important point in the packing of amalgams that is not realized by the profession. It seems to be required that every portion of the material be subjected to the direct pressure of the instrument, in order that it may not shrink in hardening. This has been very noticeable in these large fillings made entirely with broad points. I found that to avoid gaps appearing, I had to go around the margins very closely and carefully. In practice this should be done with a smaller instrument, used frequently, but not with such force as to break up the integrity of the partially packed material,—*i.e.*, the instrument should be used often in such a way as to compress, not to cut into, the material.

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* During fourteen days elapsing since the above was sent to the printer, the test fillings have continued under observation. A further contraction of one ten-thousandth of an inch has occurred in about one-third of the fillings. No expansion has occurred.

The influence on shrinkage of cutting out all softened material with a sharp, spoon-shaped instrument is so notable that it recommends itself for very careful consideration. Although previous studies had in some degree prepared me for this, it was nevertheless a great surprise, and, after careful studies of it in the few cases in which it was tried in the series of fillings presented, others were made, the observation of which could only extend a few days, to see if the findings would be confirmed. The good effects of the procedure have been obvious in every case. Pack a layer of amalgam thoroughly, and then go over it with a sharp, spoon-shaped instrument and remove material until only a firm, hard surface remains. Then add and condense more material and repeat the removal of softened portions, repeating this until the cavity is more than full, and then finish down.

Clinical observation of amalgam fillings leads to the inference that chemically the material stands fairly well in the mouth, the objections to it being confined almost entirely to its variations in color and its discoloration of the teeth. There is abundant clinical observation that goes to show that the discoloration of the substance of the tooth does not occur if the margins are tight. It is only the leaky amalgam filling that discolors the tooth. The feature that strongly condemns amalgam as a filling-material has been the difficulty of making tight margins and maintaining them. This difficulty is inherent in the physical characters of the material, and the nature of these difficulties has now, in some degree, been pointed out. If these studies, together with others in this line which may follow from other sources, will enable us to form plans of procedure applicable to general dental work that will secure and maintain perfect margins with the silver-tin amalgams, this material must take a much higher rank in dental operations than it has deserved up to this date.

There are many points of importance relating to the silver-tin amalgams that have not been sufficiently studied. Considerable effort has been made to find its limit of elasticity, but as yet no elasticity whatever has been discovered, and it must be exceedingly small. The expansion of mercury by heat is the greatest of any of the metals, and in fillings of amalgam this may be of some importance in view of the fact that the strength of the amalgam—its resistance to flow—is not sufficient to compel the elasticity of the teeth to accommodate a change of its bulk. Therefore if the elasticity of the amalgam is not sufficient for the accommodation of its expansion by heat imparted by hot foods, it must suffer permanent change of form. In my tubes I have found as the average of three experiments, which differed less than five one-hundred-thousandths from each other, a permanent spheroiding of five ten-thousandths of an inch from an increase of temperature from 75° F. to the temperature of boiling water, which with the barometer at 29.45 would be about one hundred and twenty-four degrees. In these experiments there seemed to be a change in the crystallization of the surface of the amalgam, which leads to the inference that there was some other reason for change of bulk than simply expansion from the rise of temperature.

It had been the intention to make an experimental study of the tensile strength of amalgams, of the influence of the ageing of alloys, of the washing of the mass, of the stress required to dislodge or start the margins of fillings in the natural teeth, using specially prepared cavities, and a number of other questions that I had on my list. But this experimental work has been so difficult and exacting, and has now extended over so much time, that in order to present some studies of copper amalgam and of gold, these must be deferred.

(Concluded next month.)

# THE EARLIEST DEVELOPMENT OF THE LOWER JAW-BONE.

BY CARL HEITZMANN, M.D., AND C. F. W. BÖDECKER, D.D.S., M.D.S.

## HISTORY.

UNTIL 1858 the idea prevailed among histologists that bone-tissue originated by a direct calcification of cartilage. This hypothesis, however, afforded no explanation of many significant facts, as, for example, the presence of the canaliculi, of which there was no visible trace in the hyaline cartilage. In the year referred to H. Müller* announced his conclusion that the cartilage first breaks down into medullary tissue, from which the bone-tissue develops. At the time it was known that all the bones of the skeleton arise from pre-existing hyaline cartilage, with the exception of the flat bones of the skull, which, in the human embryo, form, about the fourth month of intra-uterine life, from pre-existing fibrous connective tissue. To-day we admit only two sources for bone-tissue,—*i.e.*, it forms either from pre existing hyaline cartilage or from fibrous connective tissue. The establishment of the fact that bone can arise from embryonal or medullary tissue only, greatly simplifies our views of its development, as, whether the medullary tissue has originated from a previous hyaline cartilage or from previous fibrous connective tissue makes no difference; the manner of development of the bone will be the same. Nay, where there is no definite tissue (cartilage or fibrous tissue) present, bone may develop directly from indifferent or embryonal tissue. This is especially the case with the lower jaw.

Heretofore the formation of the lower jaw has been studied but little. J. F. Meckel† was the first to demonstrate that the lower jaw originally contained a cartilaginous rod, which in the earliest embryonal development is a prolongation, on either side of the jaw, of the malleus. A. Kölliker‡ maintains that in the human embryo the anterior ends of these cartilages lie in close proximity at the future maxillary suture, but, as a rule, without being connected with one another. They atrophy from the sixth month throughout their entire extent, except their foremost ends, which, early in the third month, become ossified and take part in the formation of the lower jaw, and a cartilaginous remnant at the symphysis toward the oral cavity, which persists till after birth, but perishes during the first year of extra-uterine life. At the outer surface of Meckel's process appears, in the second half of the second embryonal month, the inferior maxilla, developing from a primal minute starting-point. It assumes the shape of an elongated crescentic piece or shell on the outside of Meckel's cartilage, exceeding the latter in size by the beginning of the third month. The inferior maxilla, therefore, is not of cartilaginous origin.

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* "Ueber die Entwicklung der Knochensubstanz." Zeitschr. f. Wissensch. Zoologie, Bd. IX.

† Anatomia, IV Bd., p. 47.

‡ Entrickelungs-Gesch. des Mensch., 1859, p. 472.

Meckel's cartilage, in connection with the cartilaginous malleus, is easily traceable in the human embryo of forty to forty-two days (about six weeks). Foster and Balfour have studied the formation of bone in the chick embryo, in which Meckel's cartilage is likewise present. They observe that this cartilage soon becomes covered by investing bones, which form the mandible of the chick. J. Tomes says of the first development of the lower jaw of the human embryo, "About the fortieth day a center of ossification appears in the mandibular process, which soon forms a slight osseous jaw, outside of Meckel's cartilage. The latter is not, however, in any way implicated in it, and soon begins to waste away, so that by the end of the sixth month it has disappeared. That end of it alone, which extends up to the tympanum, does not waste away, but becomes ossified into the malleus."

There are, however, observers who hold that in some animals, at all events, Meckel's cartilage plays a more active part in the ossification of the jaw. W. X. Sudduth[*] gives an illustration of Meckel's cartilage alleged to be from the jaw of a two and one-half months' human embryo undergoing, as he says, ossification ; but the specimen depicted appears to be from an embryo not more than six weeks old, and it shows merely calcification, not ossification. The bone first formed, though inverted, is correctly drawn around the cartilage.

According to Oscar Herting,[†] a separate nucleus of bone develops in the articular portion of Meckel's cartilage. The main cartilaginous portion is surrounded by a covering bone, which furnishes the lower jaw. A small portion of the hyaline cartilage receives, at the foremost end, a separate bony nucleus, and afterward fuses with the main bony mass. Remnants of cartilage can be seen at the central symphysis in the new-born.

Among the more recent observers who have added to our knowledge of the development of bone, Gegenbaur[‡] deserves mention. He discovered rows of medullary corpuscles along the borders of growing bone-tissue, which he termed "osteoblasts" (bone-formers). That the elements of these corpuscles really produce the bone has also been admitted by later observers, among them Waldeyer, Rollett, and others, although no clear description of the formation of bone has been given by any of the authors named.

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[*] American System of Dentistry, 1886.

[†] Lehrb. d. Entricklungsgesch., 1893.

[‡] Jenaische Zeitschr. f. Medic. u. Naturwissensch., 1864 and 1866.

## *Preliminary Remarks.*

The lower jaw is one of the earliest, if not the earliest bony formation in the human embryo. For the study of this subject we have selected specimens from three different human embryos in or about the sixth week of development. As will be seen later, we had good reasons for so doing, since each of the three embryos illustrates a different stage of the earliest formation of bone, an opportunity which rarely offers in the formation of any other part of the skeleton. Each of the three embryos was originally kept in alcohol, and afterward placed in solutions of chromic acid of from one-eighth to one-fifth of one per cent. The heads of these embryos were sliced into thin sections, partly in a frontal (lateral right to left) and partly in a sagittal (antero-posterior) direction. The sections were stained with ammoniacal carmin, the oldest and, in our conviction, still the best method of dyeing embryological specimens. The mounting was done in chemically pure glycerol. We cannot emphasize enough the superiority of this method over the mounting in Canada balsam, which latter, though applicable for low powers of the microscope, renders the specimens unfit for study with the higher powers,—*i.e.*, those exceeding five hundred diameters.

Investigators who adhere to the cell doctrine will not be able to comprehend clearly the intricacies of development of bone-tissue. If we assume that each cell, whatever its significance, is an individual, and so continues during its existence, the morphological changes of the protoplasm will remain a puzzle. It is only on the basis of the views first announced in 1873 by one of us, that the tissue-changes, so striking in the developing bone, become comprehensible. This theory maintains that there are no individual cells in any of the tissues composing the animal and vegetable organism, but that there are continuous masses of protoplasm partly unchanged and partly transformed into basis-substance, cement-substance, cellulose, etc.

The living matter proper usually traverses the protoplasm in the shape of a delicate filigree or reticulum, and this reticulum likewise pervades all the secondary products of the protoplasm, such as basis-substance, cement, cellulose, etc. The protoplasm at any moment may become basis-substance, and, *vice versa*, basis-substance may revert into protoplasm. The essential feature, in all cases, is the presence of the living matter, which enables the basis-substance to become protoplasm once more and produce new elements. Such a mutation is possible, whatever the nature of the basis-substance.

To properly understand the process of development of bone, it is essential to bear in mind that a formed glue-yielding basis-substance, though saturated with lime-salts, may, after the solution of the lime-salts and the liquefaction of the basis-substance proper, revert to protoplasm. This doctrine, which the late L. Elsberg has dubbed the "bioplasson" theory,—bioplasson meaning the living matter,—has been acknowledged to be correct by S. Stricker, in Vienna; but P. Grawitz, of Griefswald, in Germany, although fully aware of the capacity of the basis-substance to proliferate and produce new elements, still clings to the old cell theory.

It would seem impossible for those who adhere to the secretion theory concerning the production of the basis-substance to understand the development of bone-tissue. This view, that the cells secrete the basis-substance which accumulates around the cell-body, is to-day held by but few prominent histologists. W. X. Sudduth is one of these. With him every osteoblast is a future bone-cell, which rests comfortably in the house of lime-salts which it has built for itself. It will be shown later on that the facts brought out by the microscope are by no means in accord with such views.

All advanced histologists to-day hold the views first announced in 1861 by the late Max Schultze, of Bonn, Germany. In this view everything which we call basis-substance was originally protoplasm. If we add that the protoplasm, upon being converted into basis-substance, does not entirely become lifeless glue, but still contains the filigree of living matter, even though hidden in the calcified basis-substance, we attain a position from which we can have an insight into the intricacies of the formation of bone-tissue.

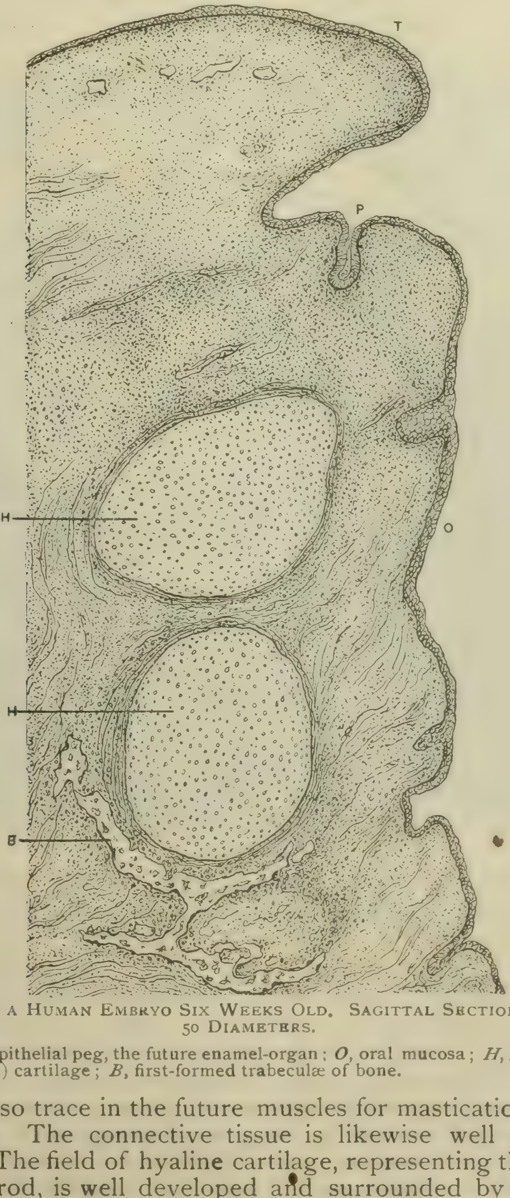
### *The First Appearance of the Lower Jaw-bone as seen with the Microscope.*

Sections through the lower jaw of different human embryos present images which vary in the stage of formation of bone presented, probably dependent upon the constitutional peculiarities of both mother and child. We wish to draw attention to a mistake made by A. Kölliker, who, as before quoted, maintains that the first trace of the maxillary bone is observable in the second half of the second month. As a matter of fact, it is in the first half of the second month, during the sixth week, when the earliest trace of bone-tissue is shown.

In Fig. 1 is shown a specimen from a sagittal section of the lower jaw. The epithelial cord in this embryo corresponds to that of the seventh week of intra-uterine life ; but the general formation of the tissues, the absence of striped muscle-fibers, and the rather scanty production of bone-tissue indicate that the embryo was ill developed and of a poor constitution. This is corroborated by the study of the specimen with higher powers of the microscope. (See Fig. 4.) A striking feature of the jaw under consideration is the presence of two rods of Meckel's cartilage, a condition not heretofore mentioned by any previous observer. We must deny the possibility that the lower rod of cartilage corresponds to the future arch of the hyoid bone, likewise an offshoot of the malleus, since the two rods are too near together, and the bone-formation begins below the lower rod ; and the cartilage of the hyoid arch changes to bone at a much later period of embryonal development. Around the transverse section of the upper rod there is no trace of a bony formation, while around the lower periphery of the lower cartilaginous rod we notice a rather imperfect beginning of bone-formation, independent of the cartilage and consisting of a few branching calcareous ledges. Higher powers of the microscope show that these ledges consist merely of a deposition of lime-salts, without the production of regular bone-corpuscles. This fact we consider again as a proof of a poor constitution and malnutrition. We also wish to draw attention to the fact that the corpuscles in Meckel's cartilage in this specimen are small and numerous.

In Fig. 2 is depicted a section of the lower jaw of an embryo just six weeks old. This age is proven by the appearance of the primitive furrow, which we know to be the beginning of the epithelial cord of the future enamel-organ. The embryo evidently was normally developed, for in its tongue we see bundles of striped muscle-fibers such as we can also trace in the future muscles for mastication, especially the masseter. The connective tissue is likewise well advanced in formation. The field of hyaline cartilage, representing the transverse section of a rod, is well developed and surrounded by an indistinct layer of perichondrium. Below the cartilage, and independent of it,

FIG. 1.



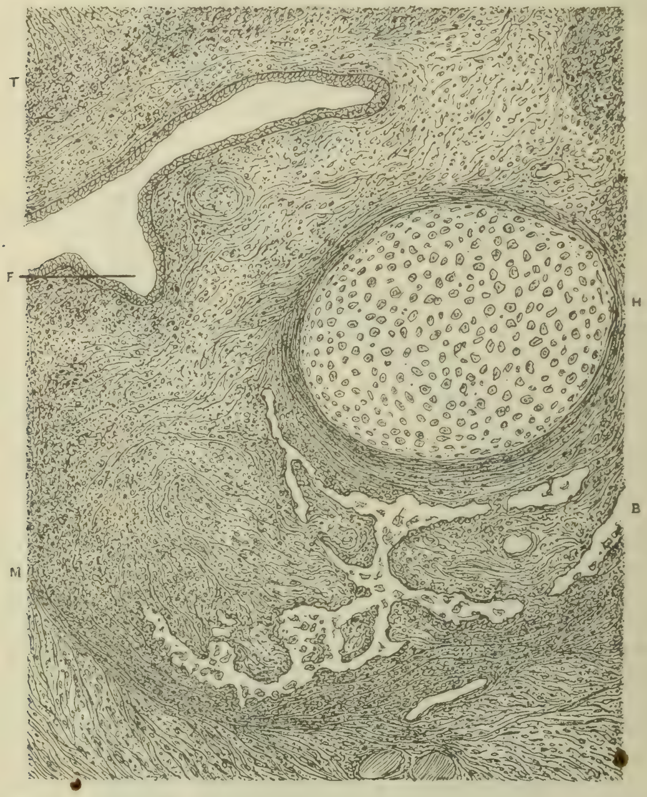
LOWER JAW OF A HUMAN EMBRYO SIX WEEKS OLD. SAGITTAL SECTION. MAGNIFIED 50 DIAMETERS.

*T*, tongue; *P*, epithelial peg, the future enamel-organ; *O*, oral mucosa; *H*, *H*, two nodules of hyaline (Meckel's) cartilage; *B*, first-formed trabeculæ of bone.

we observe calcified trabeculæ of the future jaw-bone extending downward and forward, where, as is well known, the first shell of the jaw-bone makes its appearance.

The trabeculæ show a further stage toward ossification,—*i.e.*, calcareous ledges, containing large protoplasmic tracts, but only a few fully developed bone-corpuscles. The forward points of the trabeculæ have not progressed beyond the stage of calcification.

FIG. 2.



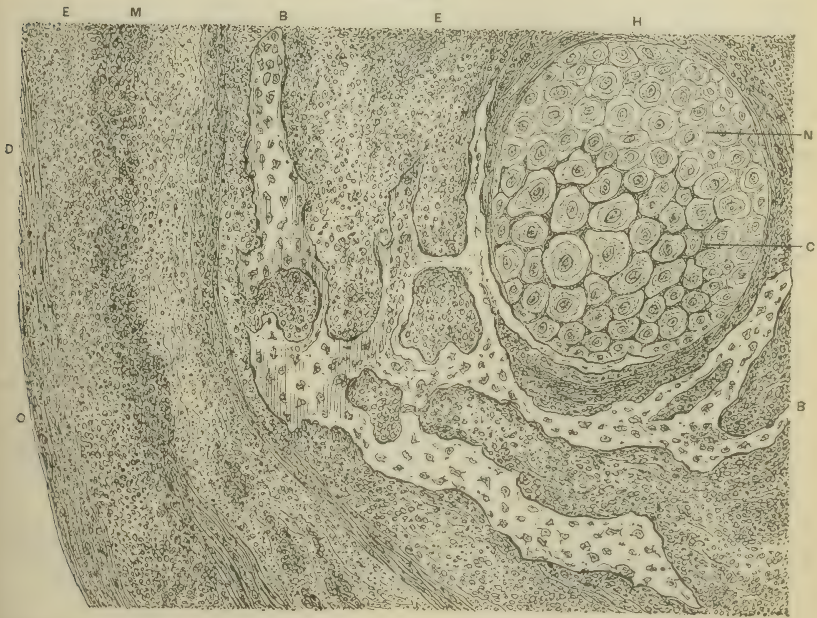
LOWER JAW OF A HUMAN EMBRYO SIX WEEKS OLD. SAGITTAL SECTION. MAGNIFIED 100 DIAMETERS.

*T*, tongue; *F*, furrow, the first step toward the formation of the enamel-organ; *H*, nodule of hyaline cartilage; *B*, first-formed trabeculæ of bone; *M*, medullary tissue, from which bone-tissue develops.

Fig. 3 is likewise an illustration of a section of the lower jaw taken from a human embryo six weeks old. Here the cancellous bone outside of and below Meckel's cartilage is further developed than in the two previous specimens. Directly at the lower border of the cartilage there is a ledge of calcified tissue, which does not as yet exhibit the characteristic features of bone-tissue, whereas the remainder of the trabeculæ represent a fairly well-formed bone-tissue. The nodule of cartilage is larger than in the two previous cases. The cartilage-corpuscles themselves are likewise large, being imbedded in an apparently structureless basis-substance that surrounds the cartilage-corpuscles. At the border-line of the fields of basis-substance a rather dense and highly refractive net-work is seen, corresponding to the borders of the territories. In the upper portion of the cartilage the net-work is free from lime-salt deposits. In the lower portion, on the contrary, the ledges along the border-lines of the territories show a granular deposition of lime-salts,—a feature long since shown to precede the transformation of hyaline cartilage into bone.

In order to study the minute development of bone, we must resort to higher powers of the microscope than those used for the previous figures, and we have chosen for this purpose an amplification of six hundred diameters. The process of ossification is by no means so simple an affair as is represented by most histologists. On the contrary, there is a series of changes, representing, as it were, a zigzag line, the earliest curves of which correspond to the least complete, the last curves to the most perfect tissue-formation. At first simple calcification takes place; later a reduction of the calcified tissue into protoplasm occurs, and a more perfect tissue develops, far, however, from regular bone-tissue; next, a reduction into indifferent protoplasm occurs, and at last a tissue will be the result, which we may with good reason call bone-tissue, though as yet imperfect.

FIG. 3.



LOWER JAW OF A HUMAN EMBRYO SIX WEEKS OLD. FRONTAL SECTION. MAGNIFIED 100 DIAMETERS.

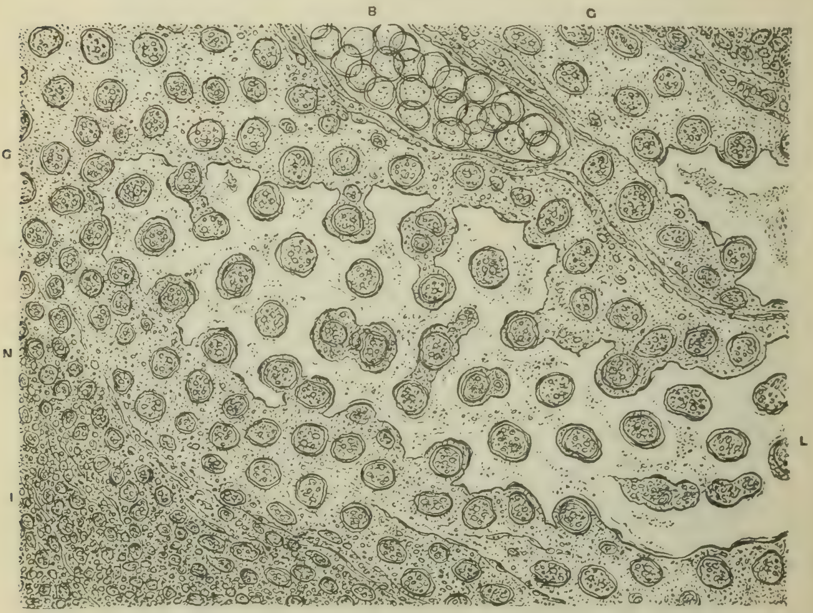
*O*, outer surface, the epithelium detached; *D*, future derma of the skin; *E*, *E*, embryonal, indifferent, or medullary tissue; *M*, layer in which striped muscle-fibers appear; *B*, *B*, trabeculæ of cancellous bone; *H*, hyaline cartilage; *N*, non-calcified portion of hyaline cartilage; *C*, calcified portion of hyaline cartilage.

All these changes appear in or about the sixth week of embryonal life, and, as mentioned above, our three embryos represent three degrees of formation of bone. Even in the most advanced specimen the previous stages are traceable at the extreme peripheral portions of the forming trabeculæ.

### *I. Calcification. (See Fig. 4.)*

A zone (*I*) is observable, in which there are no pronounced morphological elements, but only granules and lumps of living matter crowded together, rendering such fields dark. All these granules and all these lumps of living matter are interconnected by means of minute offshoots. This tissue, lacking as yet any definite character, we would term indifferent, or a tissue in the state of protoplasmic indifference. Gradually some of these lumps of living matter increase in size and become separated from one another by interstices of a more finely granular protoplasm,—*i.e.*, a protoplasm in which the points of intersection of the reticulum of living matter are smaller and paler than in the zone of accumulated living matter.

FIG. 4.



DEPOSITION OF LIME-SALTS IN THE MEDULLARY TISSUE, THE FIRST STEP TOWARD THE DEVELOPMENT OF BONE. MAGNIFIED 600 DIAMETERS.

*I*, zone of protoplasmic indifference; *N*, zone of nucleated protoplasm; *G*, *G*, zone of formation of glue-yielding basis-substance; *L*, zone of deposition of lime-salts in the basis-substance; *B*, capillary blood-vessels filled with red blood-corpuscles.

According to the usual nomenclature of histologists, the globular bodies now present may be termed nuclei, although borders of individual cells are nowhere distinguishable. We would prefer to term such masses a "multinuclear protoplasm."

In the next stage, the nuclei have still more increased in size, and between them are seen fields with fine granules only, showing the reticulum of living matter but very faintly. We have now a formation before us in which the interstitial protoplasm, between the nuclei, has begun to be infiltrated with basis-substance. In this process the reticulum of living matter does not perish, but becomes less conspicuous, owing to a chemical transformation of the original liquid filling its meshes into a more solid nitrogenous substance, commonly termed glue-yielding basis-substance. At last a deposition of lime-salts takes place in the basis-substance, a stage which we term "calcification."

Of one fact we are absolutely certain,—viz, *that the cells or the nuclei do not secrete either the glue-yielding basis-substance or the lime-salts.* We cannot tell, however, whether the lime-salts are deposited in small spherules,—the calco-spherules of other authors,—since our specimens have been treated with chromic acid, which of necessity has, at least in many places, dissolved out the lime-salts.

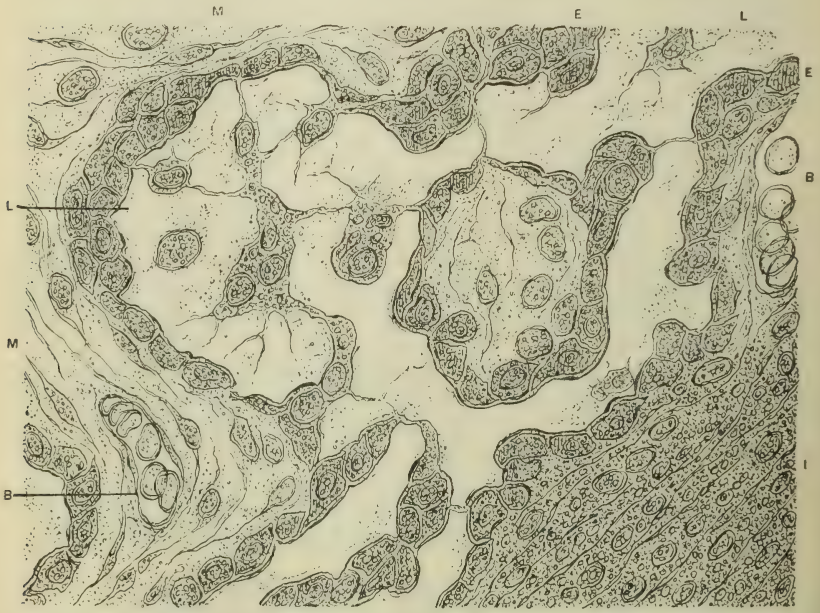
The appearance of a previously calcified basis-substance is rather characteristic under the microscope, owing to the high degree of refraction of the previously calcified parts. Such a calcified basis-substance shows only vestiges of the reticulum of living matter, best obviously in portions where the calcification was least intense. The nuclei either border directly upon the calcified basis-substance, or between them and the secondary formations a narrow intervening zone of protoplasm intervenes. Here and there large protoplasmic masses containing several nuclei, or rather several lumps of living matter, are noticeable. This probably does not indicate an incomplete calcification, but a local dissolution of the lime-salts and a liquefaction of the basis-substance as the imitation of the second stage in the development of bone-tissue.

We observe also large fields of calcified basis-substance, admitting of but one interpretation, viz,—that a certain number of nuclei have likewise been transformed into basis-substance, and infiltrated with lime-salts.

## *II. Reappearance of the Protoplasmic Condition and New Formation of Medullary Corpuscles. (See Fig. 5.)*

In this specimen (Fig. 5) we again notice a stage of protoplasmic indifference (*I*), in which both larger granules and lumps of the size of nuclei have made their appearance. Between these formations is a coarsely granular protoplasmic mass, in which by a grouping of the granules into slender spindles an attempt is made at the production of fibrous connective tissue. The calcified ledges of basis-substance are, in some places, as yet narrow, not surpassing in breadth those depicted in Fig. 4. In most places, however, they are broader, of a high refraction, which evidently is due to a saturated infiltration with lime-salts, not only of the basis-substance, but also of the scattered protoplasmic bodies of the size of nuclei. The most conspicuous feature is the presence of coarsely granular and irregularly shaped protoplasmic bodies, termed medullary corpuscles or "osteoblasts." We meet with rows of such corpuscles all along the borders of the calcified ledges. They are separated from one another by narrow ledges of cement-substance, which invariably are pierced by delicate conical spokes serving for the interconnection of the medullary corpuscles. Between the latter and the calcified ledges there is invariably present a narrow light rim, in which also we can trace here and there delicate thorns. Within the ledges we notice: *first*, bodies of the size and aspect of nuclei; *second*, protoplasmic bodies of large and irregular sizes, sending broad radiating offshoots through the calcified basis-substance; and *third*, large branching protoplasmic tracts with a varying number of nuclei, or larger lumps of living matter. The fields between the calcified ledges, aside from the osteoblasts, are occupied by an ill-developed myxomatous variety of connective tissue, in which the basis-substance is not sufficiently developed to conceal the reticulum of living matter pervading it. In this tissue we meet also with a limited number of capillary blood-vessels.

FIG. 5.



FORMATION OF CALCAREOUS LEDGES, THE SECOND STEP TOWARD THE DEVELOPMENT OF BONE. MAGNIFIED 600 DIAMETERS.

*I*, zone of protoplasmic indifference; *L*, *L*, calcareous ledges, traversed by protoplasmic bodies and tracts; *E*, *E*, embryonal or medullary corpuscles along the edges of the calcified basis-substance; *M*, *M*, myxomatous connective tissue; *B*, *B*, capillary blood-vessels, containing red blood-corpuscles.

*What has become of the calcified tissue depicted in Fig. 4?* There is no doubt in our minds that, while many nuclei have disappeared in consequence of their infiltration with basis-substance and the calcification thereof, in other places both the lime-salts and the basis-substance have been liquefied. The outcome of this liquefaction is the appearance of new multinuclear protoplasmic tracts in the middle of the calcified ledges. From these protoplasmic tracts arise the bone-corpuscles proper. Around the ledges, from the material either plainly visible in the state of protoplasmic indifference (*I*), or from the living matter present in the myxomatous basis-substance (*M*, *M*), new corpuscular elements have arisen which are coarsely granular, demonstrating a plentiful supply of living matter, and partly nucleated, in which case they are termed "osteoblasts."

The medullary corpuscles or osteoblasts produce bone in one of two ways: In the first event, a number of medullary corpuscles are once more transformed into basis-substance and infiltrated with lime-salts, some of the medullary corpuscles, especially the nucleated ones, remaining unchanged and furnishing what we are wont to term "bone-corpuscles." The larger offshoots of the bone-corpuscles would then correspond to the interstices between the medullary corpuscles, in which interstices the thorny offshoots are formations of living matter.

A second possibility is that a number of osteoblasts fuse together into protoplasmic tracts, in which some portions assume the nature of glue-yielding basis-substance, while others remain protoplasm, become nucleated, and represent the bone-corpuscles proper. The osteoblasts therefore are only provisional formations, stored-up material, furnishing either directly or indirectly the material both for the bone-corpuscles and the basis-substance.

### *III. Formation of Trabeculæ of Bone.* (*Fig. 6.*)

In this stage of bone-formation we see broad tracts of calcified basis-substance, in which we recognize, at quite regular intervals, large and irregularly shaped bone-corpuscles with a varying number of offshoots.

In the previous stage such bone-corpuscles were only found sparingly; we can therefore state that it is only in the third stage that we are able to speak of a pretty regularly developed bone-tissue.

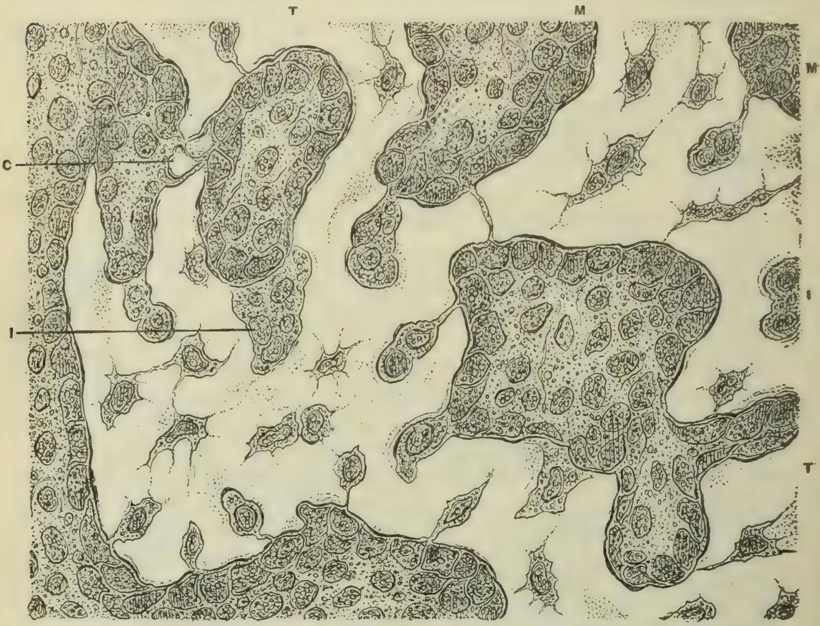
Several noteworthy features strike the observer.

*First*, we see (*C*) calcified medullary corpuscles still retaining their original shape, but made conspicuous by a high degree of refraction and a lack of granulation. They serve as a provisional connection of two already formed trabeculæ. This fact proves that medullary corpuscles, or osteoblasts, may become the direct seat of deposition of lime-salts, a fact long since known. It would indicate the correctness of the view that the osseous basis-substance may directly arise from medullary corpuscles.

*Second*, we observe protoplasmic fields within the trabeculæ with a varying number of nuclei. Such fields have already appeared in the previous stage, though in scanty quantities. We have before us the first indication of "territories,"—*i.e.*, globular fields of basis-substance around one or several bone-corpuscles. Thus far the territories are in a state of protoplasmic indifference. We can easily realize, however, that by a reduction of the peripheral nuclei into plain reticulated protoplasm, a more or less circular field of protoplasm is produced, which, being transformed at its periphery into glue-yielding basis-substance, while the central portion remains free and is eventually supplied with a nucleus, will furnish a territory of bone-tissue. Since the protoplasmic territories in our specimen have the aspect of so-called "myeloplaxes" or "giant cells," there is no doubt in our mind that whenever we see these more or less globular fields of multinuclear protoplasmic bodies, we must consider them as an ante-stage of bone-tissue territories. Such territories are not present in the earliest stages of formation of bone-tissue, but are met with around every bone-corpuscle; and the more advanced and consequently more perfect the bone formation is, the more sure is this to be the case.

*Third*, in the fully formed bone-corpuscles we notice only a few radiating offshoots. This is obviously due to our method of decalcifying specimens by means of the solution of chromic acid. The more thoroughly the decalcification has been accomplished, the less visible are the offshoots of the bone-corpuscles. We demonstrated as long ago as 1877 that the basis-substance of bone is traversed by an extremely delicate filigree,—the living matter proper, interconnecting all bone-corpuscles.

FIG. 6.



FORMATION OF TRABECULÆ OF BONE, THE THIRD STEP TOWARD THE DEVELOPMENT OF BONE. MAGNIFIED 600 DIAMETERS.

*T*, *T*, trabeculæ of bone, containing large and irregular bone-corpuscles; *I*, *I*, future bone-corpuscles in the state of indifference; *M*, *M*, medullary corpuscles, crowded along the edges of the trabeculæ; *C*, calcified medullary corpuscles.

The medullary corpuscles or osteoblasts present at this stage of development have already been spoken of in the preceding stage.

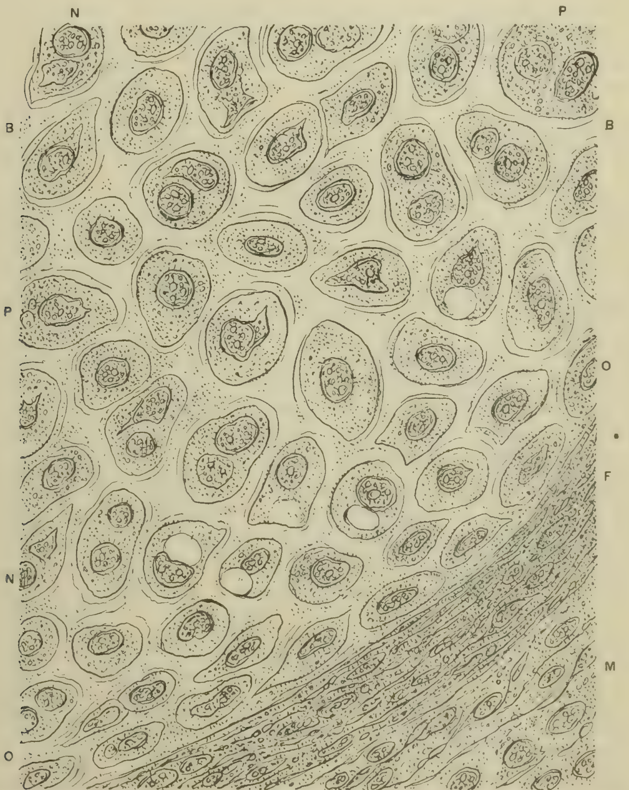
### *Hyaline Cartilage.*

This tissue is seen in the center of the future lower jaw, being both in sagittal and frontal sections a field corresponding to transverse sections of the rod-like Meckel's cartilage. Its aspect varies greatly in specimens from different embryos. It requires careful consideration, since the foremost portions of Meckel's cartilage, as is well known, take part in the production of bone-tissue.

First we will consider the cartilaginous tissue in its state of indifference. (See Fig. 7.)

We observe more or less spherical fields of protoplasm containing one or two nuclei. Sometimes the spherical form is altered by a mutual applanation or flattening of neighboring bodies. At the periphery the bodies are more elongated and more flattened. Between the protoplasmic bodies there are narrow fields of the so-called "hyaline" basis-substance, known to be extremely dense and tough. The fields of basis-substance are narrowest along the borders of the cartilage, but of a fairly uniform breadth throughout the tissue. The term "hyaline" or "structureless" is a misnomer. C. Heitzmann, in 1872, by staining methods, and A. Spina, in 1879, by alcohol treatment, demonstrated that the apparently hyaline basis-substance is traversed by a delicate net-work of living matter, interconnecting all the cartilage-corpuscles. With a power of six hundred diameters we see here and there only a fine granulation in the basis-

FIG. 7.



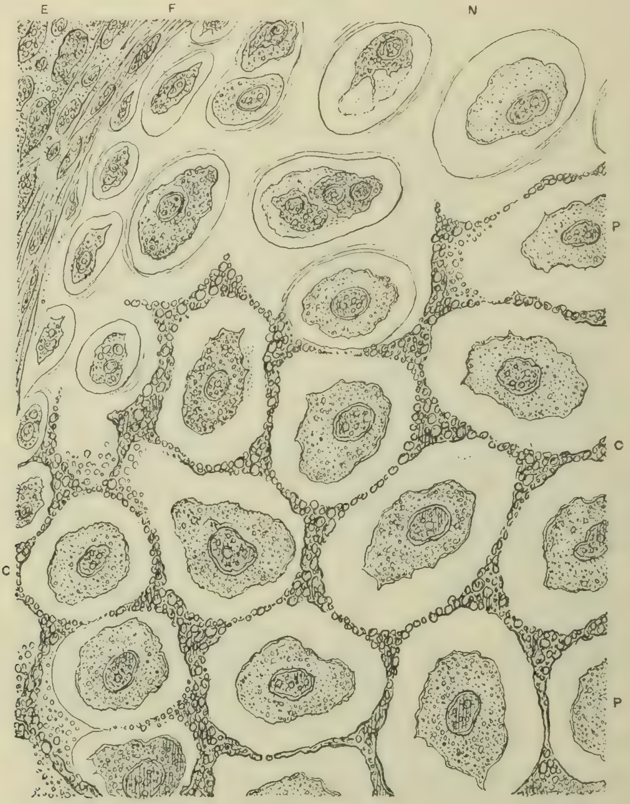
HYALINE OR PRIMORDIAL CARTILAGE IN THE STATE OF INDIFFERENCE. MAGNIFIED 600 DIAMETERS.

*N*, *N*, nuclei of cartilage-corpuscles; *P*, *P*, protoplasm of cartilage-corpuscles, partly infiltrated with basis-substance; *B*, *B*, zones of fully formed basis-substance; *O*, *O*, periphery of cartilaginous nodule; *F*, incompletely formed fibrous connective tissue, the perichondrium; *M*, myxomatous tissue.

substance. The protoplasm of the cartilage-corpuscles itself is likewise infiltrated with a certain amount of basis-substance. Hence its granulations are faint, and the reaction to certain anilin dyes and indigo proves the presence of basis-substance. Around the field of cartilage we notice the earliest stages of fibrous connective tissue, the perichondrium.

Quite different is the aspect of the cartilage in another six weeks' embryo. (See Fig. 8.)

FIG. 8.



DEPOSITION OF THE LIME-SALTS AT THE BORDERS OF THE TERRITORIES OF THE CARTILAGE-CORPUSCLES. MAGNIFIED 600 DIAMETERS.

*F*, fibrous connective tissue of perichondrium; *E*, embryonal corpuscles; *N*, non-calcified portions of hyaline cartilage; *C*, *C*, calcareous granules deposited at the border of the territories; *P*, *P*, protoplasm of cartilage-corpuscles.

In this specimen the cartilage-corpuscles are larger on the average, more coarsely granular, and are located at greater intervals than in the previous instance. To assume that these changes are due to an increase of the amount of protoplasm as well as of basis-substance, we consider erroneous. We cannot conceive of the possibility of an interstitial growth in a tissue so dense and tough as is hyaline cartilage. There are but two possibilities to explain the differences of the aspect between Fig. 7 and Fig. 8. Either the cartilage-corpuscles in Fig. 8 have been larger and the fields of intervening basis-substance wider from the very earliest formation of this tissue, or a repeated dissolution of the basis-substance, reappearance of the medullary condition, and reformation of a chondrogenous basis-substance have occurred, resulting in the tissue-changes depicted.

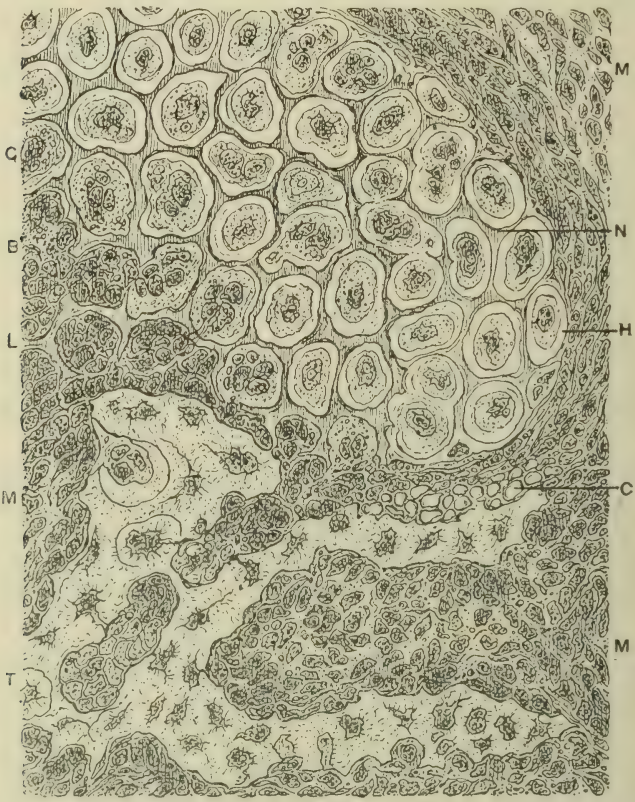
The hyaline cartilage shows two differing portions. One has the solid and highly refracting basis-substance around the ordinary one; the other shows the densest portion of the basis-substance infiltrated with calcareous granules, so-called calco-spherules. The deposition of lime-salts has taken place only in that portion of the basis-substance farthest away from the cartilage-corpuscles. Since it is known that every cartilage-corpuscle has its more or less granular territory, with the density of the basis-substance the more pronounced the further removed it is from the cartilage-corpuscles proper, we can say that the deposition of lime-salts has occurred at the border of the territories, therefore in the zone of the least nutrition. The points of the calcified ledges are sharply outlined toward the non-calcified portion. Here and there the lime-granules are seen in front view, pervading in part the ordinary basis-substance, an appearance which is due, evidently, to the section having cut the globular territory peripherally.

*The calcified cartilage breaks up to medullary tissue, from which at last bone arises.*

It is a well-known fact that cartilage becomes calcified before the appearance of bone-tissue, but the question, wherefrom the medullary tissue arises, has never been satisfactorily settled. So great, indeed, was the embarrassment of some histologists (A. Rollett, Arelzoff, and others) when studying this topic, that they resorted to the hypothesis that the medullary tissue does not originate from the previous hyaline cartilage, but is a product of emigrated leucocytes. With our view of the matter there is no difficulty whatever in explaining the production of medullary from cartilaginous tissue. Fig. 9 gives a view of the entire process with a comparatively low power of the microscope.

Let us recapitulate that not only are the cartilage-corpuscles living protoplasmic bodies, but the basis-substance, even in its densest forms and though infiltrated with lime-salts, is endowed with the properties of life. It is not the chondrogenous or elastic basis-substance proper which is alive or which can be reconstituted into living cells, as suggested by P. Grawitz, but it is the filigree of living matter everywhere pervading the basis-substance that enables the latter, after its liquefaction and dissolution, to revert into protoplasm. It is the living matter which, being set free, is able to grow or proliferate and produce new morphological elements,—*i.e.*, medullary corpuscles. In Fig. 9 we see at the lower periphery of the calcified cartilage a reappearance of the medullary corpuscles, not only from the previously formed cartilage-corpuscles, but also from the existing chondrogenous basis-substance. Thus, clusters of medullary corpuscles arise which are sharply bordered by the calcified basis-substance of the cartilage at the borders of the territories. After the dissolution of the lime-salts and the liquefaction of the previously calcified basis-substance, the medullary corpuscles are set free and immediately proceed to the formation of bone-tissue, either by being first calcified or by being reverted into indifferent protoplasm, the future territories of the bone-tissue. The entire hyaline cartilage is at last converted into bone-tissue, never directly by the so-called *metaplasia* of older writers (Virchow), but always through the intervening stage of medullary tissue, sprung from the original cartilage. The question, whether or not the lower jaw has a cartilaginous basis, thus becomes superfluous. Arelzoff answers this question in the affirmative,

Fig. 9.



First Formed Trabeculæ of Bone in Lower Jaw of a Human Embryo Six Weeks Old. Magnified 200 Diameters.

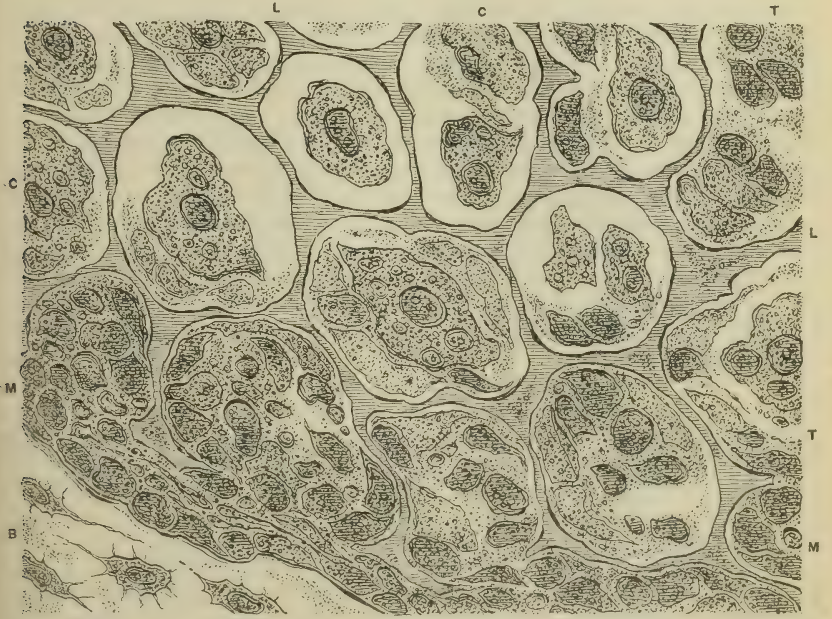
*H*, hyaline or primordial or Meckel's cartilage; *N*, non-calcified basis-substance around the territories of hyaline cartilage; *L*, calcified basis-substance of territories of cartilage-corpuscles; *B*, cartilage broken up to embryonal or medullary corpuscles; *G*, coarsely granular cartilage-corpuscles; *C*, calcified embryonal corpuscles; *T*, trabeculæ of bone-tissue with territories; *M*, *M*, *M*, myxomatous or medullary connective tissue.

Kölliker and others in the negative. True it is that the first traces of the maxillary bone appear around Meckel's cartilage, but just as true is it that certain portions of Meckel's cartilage later on likewise participate in the production of bone-tissue. To us it seems to be of little importance whether the bone-tissue forms directly from embryonal or medullary tissue, or from such a tissue produced from a previous hyaline cartilage.

Higher powers of the microscope plainly reveal the correctness of our statements. (See Fig. 10.)

Here we distinctly see the recurrence of protoplasm from the basis-substance; at first finely granular, then nucleated, later coarsely granular and supplied with numerous nuclei. Only portions of the basis-substance are transformed into protoplasm; as a rule, those portions nearest the calcified ledges first. The latter at first inclose the reformed protoplasm, from which, by an outgrowth of lumps of living matter,—possibly the nuclei themselves,—medullary corpuscles arise. These corpuscles at no time and at no stage of development are isolated bodies, so-called cells, but under all circumstances remain interconnected with neighboring analogous formations by delicate threads of living matter. Finally, the trabeculæ of the calcified basis-substance themselves are liquefied and substituted by protoplasm, whereupon the newly formed medullary corpuscles immediately become osteoblasts and proceed to the formation of bone-tissue.

FIG. 10.



BREAKING UP OF CARTILAGE-CORPUSCLES AND THEIR BASIS-SUBSTANCE INTO MEDULLARY TISSUE. MAGNIFIED 600 DIAMETERS.

*B*, bone-tissue; *M*, *M*, medullary tissue sprung from cartilage; *C*, *C*, cartilage-corpuscles with proliferating living matter in their protoplasm; *T*, *T*, reappearance of protoplasm in the basis-substance; *L*, *L*, calcareous ledges along the borders of the territories.

To summarize the results of our observations, we make the following brief statement:

The formation of the inferior maxillary bone commences at the sixth week of embryonal life. A cartilaginous rod (Meckel's cartilage) is present; but it is not this rod which is first converted into bone. It is the embryonal tissue below and outside of the rod which furnishes the material for the production of bone-tissue. Preceding the formation of bone a basis-substance is produced from the protoplasm around bodies having the aspect of nuclei, and this basis-substance becomes the seat of a deposition of lime-salts. At the same time some embryonal or medullary corpuscles calcify directly, either preceding ossification or after the deposition of lime-salts in the basis-substance, whereby the calcified ledges of the latter become broadened.

The next stage is a dissolution of the lime-salts and a liquefaction of the basis-substance, with the reappearance of protoplasm in broad and irregular streaks. At the same time rows of embryonal or medullary corpuscles, the so-called osteoblasts, arise along the borders of the calcified ledges, from both the protoplasmic bodies and the basis-substance of the surrounding myxomatous tissue. Then after repeated liquefaction of the calcified basis-substance, globular or semi-globular multinuclear protoplasmic masses make their appearance, the future territories of the bone-tissue. The hyaline (Meckel's) cartilage first becomes calcified by a deposition of lime-salts at the borders of the territories of the cartilage-corpuscles. Next protoplasm reappears in the so-called hyaline basis-substance, and by an augmentation of the bulk of the living matter contained in the newly reproduced protoplasm medullary corpuscles originate, filling the entire territory of a previous cartilage-corpuscle. Ultimately the calcified ledges at the borders of the territories are also liquefied, whereupon the medullary corpuscles are set free, becoming osteoblasts. The process of ossification is the same, whether the bone-tissue is directly formed from embryonal or medullary tissue, or from such tissue sprung from previous hyaline cartilage.

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# SUCCESSFUL TREATMENT OF A CASE OF GUNSHOT WOUND OF THE LOWER JAW, CAUSING COMPOUND COMMINUTED FRACTURE.

BY RUPERT G. BEALE, D.D.S., PHILADELPHIA, PA.

(Read before the Pennsylvania Association of Dental Surgeons.)

I WAS called by Dr. Joseph Hearn and Dr. Oscar H. Allis to an interesting case of compound comminuted fracture of the lower jaw, and the details of the methods employed seem to warrant record. The case was that of Dr. K., who was awakened from his sleep to find a burglar standing over him with a pistol pointed at his head. He arose to a sitting position, and, as he did so, the man fired, the bullet striking the doctor in the right cheek, passing obliquely downward without injury to the upper jaw, striking the crown of the lower first molar, passing completely through the body of the bone, driving the anterior root of the tooth into the basilar portion of the jaw, the bullet lodging in the neck, and causing a compound comminuted fracture of the lower jaw.

Upon reaching the hospital, I found the patient had been shot five days previously ; the ball had been extracted from the neck, and a drainage-tube inserted. An examination of the mouth showed a perfect denture, with the exception of the first molar, which had been shattered to pieces, and considerable laceration of the gums. The second and third molars were found to be very loose and leaning toward the tongue ; crepitation and displacement were well marked. Owing to the swollen and tender condition of the side of the face and neck, a more minute examination could not then be made. An upper impression was taken. Before taking the lower impression, the fracture was reduced and held in position by an assistant. The fragments acted admirably as a wedge to hold the arch of the jaw in position, and aided in securing a sharp impression. For this purpose modelling compound was used, with the surface oiled to insure sharpness. Casts were obtained from the impressions and the lower cast cut at the place of fracture, and the sections thus made so arranged as to antagonize perfectly with the upper teeth. A splint of vulcanite spanning the fracture was made on these casts. This held the loosened teeth in place. It extended to the third molars on the opposite side, and terminated so as not to impinge upon the gums. The usual opening was made in front for feeding, and a portion of the rubber cut away along the cutting-edges of the upper and lower front teeth to ascertain when the splint was in position. A day later the splint was introduced and bandaged securely in place. A consultation was held in the afternoon, and it was decided to remove the fragments of bone. The patient was etherized and the fragments removed posterior to the second bicuspid and anterior to the second molar, including the roots of the first molar, and part of the internal and external alveolar plates of the second and third molars, making in all ten pieces of bone. The fracture proper measured at the alveolar border one inch and a quarter, and at the basilar border three-quarters of an inch, including one inch of the inferior dental nerve and artery. The second and third molars were pressed into place, the wound was thoroughly cleansed, and the splint and bandage placed in position.

The operation of removing the bone was rather premature, as only five days had elapsed since the time of the assault, and hence exfoliation was only partial. Part of the periosteum and the attachment of the mylo-hyoid muscle clung to the bone, but did no harm, as granulations formed promptly and the wound healed rapidly. The lower jaw could not be held very firmly in the splint, owing to pressure made by the bandage on the swollen side of the face and neck.

Five days later a sub-mental splint of vulcanite and a compress of wood were put on and held in position by a bandage spanning the swelling. The compress and bandage were similar to those used by Dr. Bean in 1864. The compress consisted of a piece of wood five inches long and one and one-half inches wide, with a crescent-shaped depression cut in the back to accommodate the throat, and extending out on each side of the face, to allow the bandage to span the swelling. From each side of the board a piece of surgeon's webbing was attached, which was buckled to a cap covering the top of the head. With this form of compress and bandage direct pressure could be made on the jaw without inconveniencing the patient. We had previously applied a Barton's bandage, but owing to the painful tumefaction and swelling of the injured cheek, the patient was not able to endure the suffering which the pressure of this form of bandage caused. By the device of fitting beneath the chin a compress, the ends of which extended beyond the point of greatest convexity of the cheek, all lateral pressure from the bandage was avoided and entire comfort to the patient secured.

From the parts being held quiet and in perfect position, thorough union was accomplished, and the splint and bandage were removed in twenty-eight days, which was remarkable, considering the great amount of granulation-tissue required to fill the space. The occlusion of the teeth was normal.

It is most interesting to note that the severing of the inferior dental nerve and artery did not result in the death of any of the nerves of the teeth, but merely in a partial loss of sensation on the right side of the face for a short time.

The cicatrix which formed after the removal of the drainage-tube was about the size of a small marble. The patient, by manipulation with the thumb and finger, brought about absorption of this lump in a short time.

A much quicker method of making a splint than that described by my uncle, Dr. Alonzo P. Beale, in the "American System of Dentistry," is to mold the rubber directly on the tin foil covering the casts, and fill the space between the jaws with a strip of rubber, leaving the opening in front. The indentations in the rubber should be covered with a thin layer of clean wax. In vulcanizing the rubber this will take the place of the wax and give its surface a smooth finish.

For this case a sub-mental splint was made of vulcanite on a cast taken from an impression of the chin. Sub-mental splints of this material can be used universally. If too small for a case, it can very readily be molded by heating and bending; if too large, a layer of soft modelling compound can be laid inside and molded to the chin. If direct pressure is necessary at any one point, place a layer of compound where needed, and have the inner side well padded with one or two layers of cotton. This makes a neat-fitting sub-mental splint, one that is firm and well adapted to the parts, besides allowing perfect comfort to the patient by relieving the tender parts of any pressure. Splints of this kind can be also very satisfactorily made of gutta-percha.

# PROCEEDINGS OF SOCIETIES.

## DENTAL SOCIETY OF THE STATE OF NEW YORK.

ANNUAL meeting held at Albany, May 8, 1895.

Dr. R. OTTOLENGUI presented the following

### REPORT OF THE CORRESPONDENT.

MR. PRESIDENT AND GENTLEMEN,—I venture this year to offer you a report upon a subject somewhat at variance with those of former years. I regret to say that whilst at the outset the field which I have undertaken to explore is one which seemed to be a fruitful one, promising interesting results, having garnered the meager crop the harvest does not come up to the apparently well-founded expectations.

We have, from different sources, had many essays upon the subject of advertising in dentistry, but they have mostly been emanations from truly ethical men, whose tenets precluded their considering the matter from other than a standpoint of opposition to such methods.

I conceived the idea of corresponding with the typical advertising dentist, with the view of hearing argument on that side of this vexed question. In some doubt as to the wisdom of this course, I also thought of corresponding with European dentists upon the subject of erosion, which is to engage our attention at this meeting. In a quandary, I consulted with our president, and together we decided that there would be enough erosion at this meeting, and that it would scarcely be courteous for the correspondent, whose report would precede the essayists, to pre-empt the field allotted to them. I therefore have carried out the first scheme.

At the very outset, I was met by a curious fact. I asked a friend, who knows nothing of the dental world, but whose time is less valuable than my own, to procure a business directory of the city of New York and copy from it a list of dentists who advertise. Imagine my utter astonishment to find on the list which he brought to me the name of a gentleman who has been highly honored in dental societies, having been twice president of this society, and also the name of another gentleman who has been president of the First District Society.

I asked my friend, to whom these gentlemen were known neither by name nor reputation, how he could possibly have thought that they are advertising dentists? His reply was, "Well, their names are in large type, the same as the other advertising men."

This raises a delicate question. Is it advertising to have one's name in larger type in a directory than is used for the majority of men? The essence and aim of advertising is to attract attention to one's business, with the object of gaining patronage thereby. Any published matter which accomplishes this, and especially if it be paid for, must categorically be considered advertising, however mild. A business directory is a directory in which the publisher groups together the names of men occupied in given lines of trade or professions. One use of a business directory is where a person, desiring the address of a specified individual, whose name, let us say, has been forgotten, turns to the known business of that individual and looks through the list until the eye is attracted by the familiar name. The appearance of a name and address of a professional man in such a list, in the same type as his neighbors, cannot possibly be criticised. But there is another use to which the directory is put. This is where a stranger at a hotel, desiring service, looks over the list, designing to choose some one living convenient to his address. Suppose that, in glancing through this list, he sees a name conspicuously larger than the others? His mind will most possibly decide that the man is conspicuously better than the others, that he is famous in his profession, and that the directory publisher has given this conspicuous type as a mark of merit. The suburban mind would certainly take this view. But suppose that, with due caution, the stranger makes inquiries and learns that the man is indeed a distinguished practitioner, he at once decides to bestow his patronage. So that, by analysis, it is seen that this very mild form of advertising, especially since the advertising is so skillfully veiled, is, after all, the most attractive that a distinguished man can adopt.

But when we go further, we learn by inquiry that while the name, in ordinary type, costs nothing, the directory publisher charges a fee for larger type, which fee increases in proportion to the size of the type. To those who may claim that this is not advertising, I will reply that only two days ago the canvasser for Trow's Business Directory was at my office to get my name for the new edition of the work. I asked the cost of having my name in larger type, and was told the regular price, and the agent then asked, "Shall I put you in in capitals?" "I am afraid," said I, "that this would be advertising." "Why, certainly," he replied, not recognizing the ethics involved, and wondering how that could be an objection in my mind.

Thus I have brought out the fact, that what my friend decided to be advertising when looking through the directory is considered to be an advertisement by the publishers of the directory, and as such has a regular price.

But whether this be advertising which we should consider as unprofessional, I do not say. I wish this point clearly understood. I do not criticise this method of attracting attention as unprofessional conduct. It is the very mildest form of advertising, however beneficial it may be, and whether it transcends the code is a question which I would rather leave for those who have more respect for the code than I have. By which I mean that if I obey the code of ethics it is because I am at heart ethical, having been reared in the South, where codes of ethics and codes of honor are obeyed in the spirit and not in the letter. For the printed set of rules called the code of ethics I have no respect whatever, nor have I much respect for the man who reads his code carefully to discover some method of accomplishing his unprofessional designs without literally disobeying the printed rules. Such a man is he who, pretending to be an advocate of the code, pays a directory solicitor for the privilege of seeing his name in larger letters than his neighbor enjoys. I do not cite any names in this connection, because in the first place I have no desire to be personal, and secondly it is obvious that any one who chooses will have no difficulty to find the names in the directory, to which the gentlemen can scarcely object, since they have paid for the privilege of having their names readily seen.

What may be termed the next higher stage of advertising which I have discovered is a social directory known as the "Society List," in which there is what is called a "Dentists' List." This has a heading in parentheses and italics, which begins, "The object of this department is to furnish families who annually purchase this book with a ready reference list of reputable practitioners, their office hours and correct addresses." Just as the business directory seemed to advance the idea of superior merit for the names in large letters, the publishers of the Society List do the same thing more thoroughly by announcing that the names on their list are safe men for the first families in New York to employ. In this list are the names of thirty-six dentists, which is quite a limited selection from the eight hundred men in New York city. An inspection of the list shows the names of six men connected with dental colleges, six others who like the first have national reputations, one who is best known from his connection and troubles with the Tooth-Crown Company, and twenty-three others whose names are scarcely known in dental circles, some of them being entirely new to me, and who certainly are not known out of New York city. The reason why the directory people have chosen this odd collection of gentlemen to care for the teeth of the elect in New York city is because they have paid five dollars each for the recommendation.

Thus having discovered at the outset that my explorations into the reasons which animate men to advertise would lead me upon most delicate ground, I decided that to be on the safe side I would only address those gentlemen who, caring nothing for professional ethics, would not feel sensitive if asked for their reasons for advertising, and so concluded to write only to those who have adopted some firm name for use on their signs and circulars and in their advertisements.

A letter was therefore prepared and sent to a number of concerns, asking for the reasons which induced their proprietors to use the name by which the office was known rather than the individual name, and if it was thought more money could be made in that way.

Letters were received from nearly all of these concerns, some of which are very instructive; one explaining that the —— Association has been converted into a private practice, is quite satisfactory, and shows that advertising is not always a high road to success. It also brings out the curious fact that men may have two methods of practice, for we find that the originators of this establishment had private offices, and when opening a public shop preferred to be unknown.

The statement from another "Dental Association" that people prefer to patronize large concerns in preference to small ones, is as amusing as it is suggestive and instructive.

But I am especially pleased with the letter from the —— Dental Association, for here we find an evidence of the possibility of growing out of an evil environment. The proprietor tells us that he worked as an assistant for the association for five years, and has now bought out one of the offices. He thinks it would be bad policy to change the name until he obtains a better footing with the patients, which is undoubtedly a sound business principle. Then he goes on to say that some people think the association can serve them cheaply because it buys materials in quantity. This is a purely commercial idea, and gives us a hint of the internal methods of the advertising men. They undoubtedly foster this notion, which must have originated with themselves rather than with the patients. He also tells us that other people think the advertiser uses cheap materials and employs cheap workmen. This is also a commercial idea, but it shows that there are people who cannot be gulled by quack notions.

A letter from the —— Dental Company is another evidence of a purely commercial mind; they conduct a dental practice just as they would a dry-goods store, choosing a name which sounds well and which will save money by saving advertising space. They are evidently in business purely for the money they can get out of it. No thought of the patient's interest could supersede self-interest in such a case. Thus we find the extreme antithesis of the professional practitioner, and one, too, of evident intelligence. The offices of the concern are fitted up handsomely, and there is an attractive air of prosperity which gives the patient a feeling of safety when intrusting his mouth to the gentlemanly assistants in charge. These assistants are probably above the average in ability. I say probably, for concerning this feature I know nothing. I argue from the apparent business capability of the management. They would evidently consider it bad policy to engage unskillful men.

The —— Dental Parlors received the name from previous owners, and the present proprietor has not changed it yet, as he is not sure he will keep it. His letter gives food for thought. He has a private office of eight years' standing, and now tries the other road to fortune, which he says is apparently much shorter.

The last letter to which I will refer is from the —— Company, and has an air of mystery about it which attracts attention. The letter is signed by a member of the concern, who declines to explain his position, except in a personal interview, which I have not sought. His extreme caution in writing to me suggests that he has something to hide, yet he speaks of his company as a corporation, which would indicate that it is incorporated. The heading of the paper gives the names of the officers, and states the capital stock is twenty-five thousand dollars, and the statement is also made that the concern owns or leases twenty-seven patents relating to modern dentistry.

This leads me to tell you the inception of this investigation. About two years ago, sitting in a restaurant in New York, I noticed a man painting a sign opposite on the glass of a window. The announcement was something like this: "Seventh Ward Dispensary. The poor treated free. All sorts of diseases cared for by specialists. Consultation free." I visited the place, and, giving my symptoms, was told that I had rheumatism and was threatened with gout. I was recommended to take certain medicine and to drink a water which would relieve my blood of the poison. For amusement, I asked innocently, "What poison?" and the answer was, "The poison which causes your pains." I insisted upon being told the specific poison which did the mischief, and was told that "It is unprofessional to explain these matters to any but medical men," a safe answer, and, to my mind, a highly audacious one, since the concern was anything but professional. Of course, the medicine could be bought at the dispensary at cost. Thinking this over, I concluded that this sort of charlatanism was of the very worst, for the reason that here a quack masqueraded under the guise of a hospital with beneficent motives. It seemed to me that it must be or ought to be illegal for such concerns to exist. Then I looked at our own profession and quickly found how many associations exist. The Dental Infirmary is a name that has not as yet appeared, but if not stopped, the tide will surely set in that direction. I believe that in dentistry, as in other business, it must be illegal for men to advertise under a corporate name without being incorporated. And this last concern, the —— Company, seems to be the only one that claims a corporate existence.

I do not intend to advocate the establishment of laws on this subject, but it seems to me that it is eminently within the constitutional right to limit the use of a corporate name in a profession to such institutions as truly exist for the benefit of the general public. Where the business is merely a money-making concern, the dentist should be compelled to practice under his own name only.

Dr. M. L. Rhein read the

## Report of the Committee on Practice.

We are in the midst of a revolution in dental practice. This had its inception when the colleges first began to increase the length of time which students must spend in acquiring a dental education. The lengthening of the college course has produced improved preparation and superior fitness of graduates. Resulting from this, a vast change in the methods and forms of practice has been permeating the ranks of our profession during the past few years. Nor is it alone confined to our younger men, but it has affected the methods of practice of every genuine professional man who recognizes the fact that his student days are never ended.

It is an old aphorism that blessings bring with them attendant evils, and so, while we may find it an easy matter to see the elevated plane we have reached with the increased benefits we are able to give to our patients, we should not close our eyes to the attendant evils that follow side by side and threaten to jeopardize the fame of American dentistry.

Let us, therefore, endeavor briefly to examine both sides of this picture, with the hope of stimulating as much interest as possible in striving for that goal of excellence, and, at the same time, endeavor to avoid the pitfalls that surround us. Let us first look upon the pleasant side of our picture.

A better preliminary preparation, deeper and more exhaustive studies, have been the means of placing in our ranks many men who refuse to be limited in their sphere of action by the alveolar sockets of the maxillæ, but claim as their rightful heritage all that world within the oral cavity. The academy of stomatology has come to stay, and the man who wishes to remain in the front ranks in the future must be a stomatologist. He must strive to master all the affections of the oral cavity, if he intends to preserve the teeth of his patients in the best manner, with the greatest skill, and by the aid of the latest scientific knowledge.

In no disease has this scientific research produced more beneficial results than in pyorrhea alveolaris. The study of the etiology and pathology of this affection has wrought a wonderful change in our treatment of these cases. It is but a short time since we grouped all cases of loosened teeth, attended with more or less purulent discharge from the gingival border, into one class, and considered them due to local causes. The so-called surgical treatment of former times hastened the dropping out of many a loosened tooth.

What is our present method of procedure? The first important and indispensable thing is a positive differential diagnosis. Accomplish this, and a true prognosis follows as surely as sunrise follows night.

Is this an easy matter? In some cases, yes; in others, it necessitates the greatest skill, the most exhaustive examinations, and patient investigation into the relative conditions of the various organs of the body, with their varying secretions. In fact, urinary examinations must often be repeated over and over again, under various conditions. We must discriminate between the conditions found in urine secreted in a state of repose, as compared to that excreted in a state of high mental activity.

In pyorrhea complex, we generally expect to find an excess of uric acid, and in this respect the ordinary urinary examination may often prove to be misleading. The worst forms of lithemia that we meet with are those in which the uric acid is retained in the system, especially about the joints, including the pericemental tissues, and not to an appreciable extent excreted through the kidneys. Imagine a patient suffering from such a condition of affairs, coming under the attention of his dentist; the latter finding a marked condition of pyorrhea alveolaris, refers him to his medical adviser for a careful examination. In the majority of cases a urinary examination will disclose nothing abnormal; and unless the physician has previously treated the patient for some disorder, he will report the general condition to be healthy.

In those cases where we strongly suspect that the excess of uric acid is kept imprisoned in the system, it is necessary for us to place the patient upon treatment by some solvent of the uric acid for a given time, before we can state positively as to the amount of uric acid excreted.

In this respect, it is well to call attention to the mistaken idea that has permeated the dental journals during the past year, that every case of excessive secretion of uric acid implies a condition of gout or rheumatism. While it is true that we find this pathological state most marked in gouty conditions, yet we find the same condition in numerous other diseases of a wasting nature, such as diabetes, febrile disorders, anemia, and in nearly all of the conditions where malnutrition plays an important rôle.

It is impossible in treating this phase of this subject to refrain from touching on the subject of erosion. In all of the diseases where there is more or less starvation of the tissues in progress, the oral fluids will become more or less acid, in proportion to the gravity of the general pathological state. As a result of this, pyorrhea complex and erosion of the teeth are frequently concomitant local results of the general disorder. In many patients who have been taught to take the best hygienic care of the mouth, we will find erosion without accompanying pyorrhea; but in those forms of pyorrhea complex where the general pathological state produces a lessened alkalinity of the circulating fluids, there is generally more or less marked evidence of erosion about the necks of the teeth. It has been fairly well demonstrated that when the oral fluids persistently show acid reaction, we can with a high degree of probability expect to find an excess of uric acid in the system.

It is unnecessary at this time to enter into the other means of diagnosticating any general disorder which may be present, but, supposing that the true nature of the disease is understood, the primary condition for improving the pyorrhea or the stoppage of the destruction of tooth-substance by erosion, is the proper treatment of the general disorder. Nothing has been of greater benefit in restoring to a normal condition, thus in effect neutralizing this acidity of the oral fluids, than the bitartrate of lithia, introduced to us by Dr. Edward C. Kirk. Do not suppose for an instant that the simple prescription of a large amount of the lithia salts is all that these patients require in the way of general treatment. Most careful attention must generally be given to the diet, both in the line of preventing indulgence in what they cannot properly assimilate, but also in seeing that they have ample sufficiency of pure water to drink and of such foods as are required to build up a system that is generally more or less anemic. Exercise and hygienic measures are also of the utmost importance. In fact, the general treatment of each case becomes a law unto itself, depending upon the mental acumen of the attending physician.

So much for the general treatment; but general treatment alone will not suffice to cure or even alleviate pyorrheal conditions. The close and careful observation of the dentist is necessary in order to determine how the local conditions, which may be found in each individual case, should be treated. A searching eye must carefully observe the surrounding conditions, as well as the character of each individual tooth. Every portion of foreign deposit must be removed from every tooth. It is wise to operate only on a very few teeth at a time. The occlusion of all the teeth must be made as nearly perfect as possible, and any deficiencies in this respect must be supplied by artificial means. Extreme care should be taken that no dead pulp is allowed to remain in a tooth. The diseased surfaces around the border of the pyorrheal pockets should be destroyed, and new and healthy granulations encouraged to take their place Different men use different means to accomplish this result. The only requirement is that this should be done thoroughly and with as little irritation as possible, and under strictly antiseptic precautions. In fact, the most difficult part of the local treatment is the keeping of these pockets strictly aseptic. A sterilizing paste, or a varnish like steresol, should complete every operation. The main duty in this regard necessarily devolves upon the patient, and unless it is faithfully carried out, all our operative procedure is of little avail. The pyrozone spray is the best adjunct we can place in the hands of our patients for this purpose. They must be instructed to use it as frequently as the exigencies of the individual case demand.

Furthermore, in respect to this disease, we would call your attention to the condition of infantile pyorrhea, which is a symptom of the condition of malnutrition which later develops into infantile scurvy, a disease which has only been diagnosticated in recent years. It is to be regretted that the limits of a report of this nature prevent any further detail in reference to this matter.

The subject which with pyorrhea has about equally divided our attention during the past year, has been the treatment of root-canals. At present, the profession seems to be divided into two parties on this question; the one led by Dr. A. W. Harlan, with his doctrine of opposition to the use of coagulants in root-canals; the other consisting of those who believe that no better material can be found for root-canals than coagulants. More time seems to have been spent in our local societies during the past year in ventilating this question than in any other procedure of practice, and the result is bound to be of inestimable value to the general body of practitioners. It appears to have been conceded by both sides that a pulpless tooth must have all the pulp-remnants removed, even to the end of the roots, under strict antiseptic precautions; the end of the canal can then be sealed and the canal filled according to the individual preference of the operator. With these precautions properly observed, both methods produce successful results.

Your present committee presented in 1888 to this society an unfavorable report on the operation of implantation of natural teeth. This was received at that time with much opposition, and your committee found itself in a decided minority. We would call attention now to the fact that we have heard very little about implantation during the past year.

We would also call attention to the marked advances made in orthodontia by Dr. C. S. Case, of Chicago. He seems to have satisfactorily solved the problem of bringing forward or backward the teeth and roots at the same time.

In the treatment of trigeminal neuralgias, we are indebted for a new operation for the removal of the inferior dental nerve to another gentleman from Chicago, D. T. W. Brophy.

The radical cure of alveolar abscess by means of surgical interference through the gum, and especially by amputating the end of the root if possible, is becoming more popular.

In this respect it might be wise to call your attention to the necessity of strict adherence to antiseptic conditions in all our work. The time has elapsed when the dentist could plead ignorance of the possible results in the use of unsterilized instruments. No office is complete without a sterilizer.

The caustic preparation of pyrozone is being largely used in bleaching discolored pulpless teeth, and lately we have heard of the increased activity obtained from pyrozone when it is aided by the use of electricity.

The diversified uses to which we can put electricity are becoming more apparent every year. At present a well-equipped office is furnished with an electric dental motor, dental lamps, pluggers, cautery, hot-air blast. The latest additions to these devices have been the beautiful porcelain furnace, annealing lamps, etc., devised by Dr. L. E. Custer, of Dayton, Ohio.

It might be well to note the fact that the use of copper amalgam has been almost entirely abandoned.

A number of efforts have been made of late to give us an improved form of oxyphosphate, one that would better withstand the action of the oral fluids.

Local anesthetics seem at the present time to run in the direction of different cocain preparations. The journals teem with advertisements of various secret preparations of this nature, and every professional man with a proper regard for himself should not only refrain from the use of any of these secret preparations, but, as a duty to his profession, he should express his active opposition to the introduction of these nostrums. Every society should officially condemn their use. As professional men worthy of a proper standing in the community, we should only administer drugs, the name, nature, and action of which are known to us.

The insertion of artificial teeth without plates or with a considerable diminution in the size of the plate, has received considerable attention. We owe our gratitude to Dr. W. G. A. Bonwill, of Philadelphia, for his work in devising and introducing dentures of this form, the principal features of which consist in a properly formed clasp, and a stop resting upon one of the adjoining teeth, or a depression in the side of one of the teeth, so that the artificial teeth cannot be pressed into the soft tissues. From this to bridge-work is but a step.

Your committee is unalterably opposed to permanent bridge-work where more than one tooth is required. We believe this form of work is bound to be superseded by different forms of removable bridge-work ; and we would call your attention to a method described by us, and which has received a very flattering reception from different sections of the country.

We have reserved for the closing portion of this report, and the one which appears to be the unpleasant side of our picture, the present tendency in the treatment of dental caries. It has become the fashion for some time for some men to speak in a rather disparaging manner of the wonderful operations of the late Marshall H. Webb, because, perchance, they may have met with some tooth that has finally given way after it had been restored to its natural shape and a useful career for many years by means of his wonderful skill. There is a crying need in the ranks of our profession at the present time for some one like Atkinson, Varney, or Webb, who would be present at all times to call the attention of each and every one of us to the highest standard of operative skill which we owe to ourselves in order to maintain that reputation which we Americans have earned. The tendency of the times seems to be to decry and undervalue the inestimable benefits that the patient can reap from difficult contour operations in gold, which necessarily require a lengthy sitting to be properly introduced.

Years ago, while our European colleagues were devoting their attention to the theoretic aspect of dental work, we electrified the world by the wonderful results obtained in restoring broken-down teeth to their natural condition of usefulness, neither exaggerating nor depreciating the contour in which nature originally formed them. We are now in danger of falling into the error made by foreign practitioners. Up to the present time no substance has been discovered which approaches in value to gold for indefinitely replacing lost tooth-structure, when the cavity is skillfully prepared and the gold properly inserted. This necessitates time and patience, two qualities which the successful practitioner must dispense with lavishness.

Our more thoroughly educated men seem to a large extent to be imbued with the idea that so much time spent on a single tooth is wasteful, and hence the invention of all kinds of matrices, as well as the popularity of the Herbst method of filling teeth.

All these latter-day inventions for abbreviating the time required to insert a gold filling have only resulted in a vast increase in an inferior form of filling, and consequent failure in the saving of so many teeth.

No invention has done so much harm as the matrix, especially in the approximal surfaces of bicuspids. The graduates of to-day are unaware of what it means to build up and knuckle the approximal surfaces of the posterior teeth without a matrix. Such work is absolutely essential before the proper use of the matrix can be understood.

It is questionable, considering the number of failures, whether an experienced and good operator is justified in placing in position a matrix and then completing the filling, without, at different periods in the operation, removing the matrix, so that he can carefully examine the work in progress. It is not our purpose to detract from the real value of a matrix in helping to fashion the shape which the gold should assume. To be used to the greatest advantage, it should be removed after the floor of the cavity has been filled to only a short height, but sufficient gold must have been inserted to insure the absolute security of the filling. At this stage the cervical border can be trimmed and polished in a manner far superior to that which can be accomplished after more gold has been inserted. In replacing the matrix at this point, it is often of great advantage to use one of thinner metal. Proceeding in this manner, according to the size of the cavity, the matrix may be removed for examination of the work from two to four times; and if the new matrix inserted is always thinner than the preceding one, it will often save considerable work in finishing the filling. When the insertion of the gold has been completed, the teeth must be separated sufficiently to admit sand-paper strips or disks, in order to finish the margins correctly without destroying the solid contact which should exist only at the cutting-edge of the approximal surface. In some cases it is wise to separate slightly before commencing the insertion of the gold; but this is more often unnecessary if the matrices are continually supplanted by thinner ones. In following this method, the malleting of the gold directly against the matrix will produce sufficient separation to allow for the final finishing of the gold, and we have the advantage of subjecting the patient to only a slight amount of pain in separating, and only for a few moments at the close of the operation. Dr. H. W. Gillett, of Newport, has invented a delicate separator which will accomplish this in most cases without any pain. One of the great advantages which gold possesses over all other materials is the ease with which it can be lapped over the edges of the enamel and remain in perfect juxtaposition therewith. To obtain the most lasting results in contour operations, the greatest advantage should be taken of this fact. The edges of the enamel should be broadly beveled for some distance over the crown of the tooth, so that the real margin of the cavity is far removed from the outer edge of the gold. Never hesitate in covering up tooth-structure in the posterior part of the mouth with gold, an indestructible substance. Too frequently anterior fillings have to be replaced because esthetic considerations have prompted the keeping in sight of deteriorated enamel-structure.

It is scarcely necessary for me to speak of the importance of the proper preparation of the cavity, or of the removal of all vestiges of caries and of reaching hard borders of enamel. Neither should it be necessary at this date to sound a warning against drilling retaining-pits into teeth with living pulps. In deep cavities, the placing in position over the floor of the cavity of a piece of antiseptic asbestos paper covered by a thin coating of oxyphosphate will be found to be very valuable. An operation performed on these lines, having the gold solidly malleted in position, leaves the tooth not only in an impregnable condition, as far as that side of the tooth is concerned, but is a comfort to the patient that can only be fully appreciated after it has replaced some inferior form of work. Many of our best men have ceased to do operations of this nature; men who years ago prided themselves on the superiority of their ability in work of this kind have allowed diplomacy, that mighty fetterer of man's conscience, to debase their manhood. Their reasons have been a desire to make their work less expensive in *present* cash, and of a less arduous nature to themselves. But at what an expense to the patient! Too often the loss of the tooth.

If our profession occupies the plane to which we are wont to extol it, then we owe it as a sacred duty to our patients to do for each and every one of them only the very best we can; anything less than that is sacrificing our honor on the altar of Mammon. How much nobler to dismiss a patient, perchance refer him to a struggling younger man, than to do an inferior piece of work because of the limited extent of his resources.

The greatest evil in this respect endangers the practice of our younger men,—the desire to accomplish quickly what, perforce, must take a longer time. The temptation of temptations in this respect is the placing a gold cap over a broken-down tooth, something which can never compare in permanency with a properly inserted gold filling. In this respect, like matrices, gold caps have their place in a well-ordered practice, but how often are they used where a careful consideration would at once show the infinite superiority of a gold filling. In teeth with living pulps, the gold cap should be the last resort, when it is impossible for the skill of the operator to restore the lost substance by the aid of cohesive gold foil. Time will not permit me to enter into all the details of makeshifts which have recently come into use to supplant operations which have always been considered the flower of American dentistry.

Our institutions of learning should take heed that the manual skill of their graduates does not suffer on account of increased theoretical training. There is no valid reason why the two conditions, manual and mental training, should not be cultivated hand in hand. To maintain our national pre-eminence as conservators of the natural teeth, we must, without lowering our value of scientific knowledge, retain the highest regard for operative skill.

## *Discussion.*

Dr. JARVIE. We have listened to a most excellent report, and one that is full of points upon which to talk. Only two of them, however, will I refer to. The first is in reference to the use of copper amalgam. The report says that within the last year we hear very little of the use of copper amalgam, and its use is being almost entirely given up. I wish I had given up its use before I commenced it. I say this publicly, because I have on more than one occasion advocated its use under certain conditions. I have used it in different ways for three or four years. At first I used it pure and simple, but soon found out it was most treacherous when used alone. I then used it in combination with other amalgam fillings, and I thought I had a very good thing; I thought I had a filling-material that was superior to any I had used in certain cases, and I continued to believe that for two years or more. I then began to have some suspicion of the integrity of the margins around such fillings, particularly between the molar teeth, where the cavities or the fillings had extended to or beyond the gum-margin. For the past six months, perhaps, I have taken out every filling of that character, where I have had the opportunity. I have found this combination most treacherous. An ordinary examination would not reveal anything amiss with the margin. Perhaps my attention would be called to that location by the patient saying there was a sense of uneasiness or discomfort there. I found that my exploring instruments would drop into places beyond the filling. I have, on several occasions, found the cavity extended into the pulp, and of such a character as to lead me to believe that there had been some galvanic action, rather than the ordinary dissolution of the lime-salts. Both organic and inorganic matter had disappeared, leaving a large cavity. I have found so many cases of this kind that whenever I see a filling of my own insertion, I take it out, hard as it is, where the plugs were made of copper amalgam, mixed with perhaps one-half of ordinary-amalgam fillings.

The other subject I wish to call attention to, was a remark in regard to the frequent insertion of gold crowns upon teeth perhaps badly decayed, but which could and should be filled with either amalgam or gold. I think this is an evil that is growing upon us. It is sometimes so easy to put a gold crown upon a tooth, and sometimes the remuneration for it is larger than would be obtained for a large amalgam filling. In many cases a gold or amalgam filling could be inserted and retained in the tooth for ten or twelve years, and at the end of that time the tooth is in as good a condition for putting on a gold crown as it was at the beginning, and the tooth has been retained for usefulness so much longer. Recently I found in the mouth of one of my patients who had been away in a different part of the country, about half a dozen crowns. One of the crowns had become uncomfortable, and I removed it. To my astonishment I found a very good tooth under it. The result was the removal of the six crowns ; three of them were on the front teeth, holding bridges of two teeth. You may imagine what the appearance of the teeth was in the mouth of a young man twenty-two or twenty-three years old, three of the front teeth crowned with gold, the face of the crowns being cut away a little, showing but a very small portion of the enamel, and the rest showing but gold. Again I say there is a great tendency to crown with gold, teeth that ought to be retained for years of usefulness with fillings.

Dr. Straw. It is very remarkable how men get different results. I told Dr. Jarvie four or five years ago exactly how to use copper amalgam. The president of this society once gave me some copper amalgam for my own use. I said if he recommended it, I would use it, but it was a failure. I thought I could improve on that by pressing out all the surplus mercury, but I did not succeed. I conceived a remote idea that there was something in copper amalgam, and I persevered and succeeded at last, as Dr. Jarvie has told you, in mixing some fillings. I do not forgive Dr. Jarvie for not coming up and staying with me a week to see exactly how I did it, and in what proportion. I have had scarcely a failure with all my six years of copper amalgam, after I adopted that plan. Of course, you have failures with almost any filling-material, but as a rule I have found no fault with the copper amalgam. I have something which I showed to Dr. Butler at my office, which beats them all. My assistant calls it "Straw's No. 1." I take the hard copper amalgam which is made in Canada, and I pulverize that as finely as I can. I mix it with oxyphosphate in equal parts ; I mix it with the fluid and put it in the tooth, and let it remain there for about half an hour, and then polish it, and it never gives out. If it is on the grinding-surface and there is a great deal of wear on it, perhaps it might, after a long time.

Dr. JARVIE. All the margins of the combination fillings would be perfect except at the gum line in between the teeth.

Dr. STRAW. You get those results from leaving the spaces so that food will lodge there, and the patient does not use a toothpick.

Dr. COON. Do I understand Drs. Straw and Jarvie to have mentioned that they mix the copper amalgam and the filings of alloy in equal portions?

Dr. JARVIE. Yes; I mix it up so it will be about equal.

Dr. COON. After my first copper amalgam fillings cupped I commenced to use copper amalgam in the lower two-thirds of the cavity, finishing with Eckfeldt & Dubois's Standard Alloy, and the only failures I have had were in closely approximating teeth, where I failed to cover the cervical margin with the alloy. Just after preparing a paper that I read to the Eighth District Society on this matter, I found that some Philadelphia men had written on this subject, and said that copper amalgam and alloys could not be made to unite. I did not read this until I had used the system for some time. With copper amalgam used in the lower two-thirds of the cavity, and the whole covered with high-grade alloy, there is no possibility of a failure from cupping. You get an indestructible surface. I find the best alloy that I have ever used is the scrap of Ash's high-grade alloy and Standard Alloy, with a lot of gold scrap. I do not remember what the exact proportion is. Simply melt together the waste product (what is left over after using the high-grade alloys) and scraps of pure gold; file it up; let it alone for several months to age, and you have a fine amalgam alloy.

Dr. BREWSTER. Dr. Straw speaks of a filling which he designates as "Straw's No. 1," and he speaks of pulverizing amalgam before it is mixed with the oxyphosphate. Will he kindly tell us how he pulverizes the amalgam?

Dr. STRAW. It is a very simple thing. These little pellets made by Weygandt, of Canada, I pound with a hammer, and then triturate them in the mortar as fine as I can. I presume that the failures of Dr. Jarvie have come occasionally from mixing too much of the ordinary filings with the copper amalgam. You must mix just barely enough to take up the surplus mercury. I have had failures from the same reason.

## TRI-STATE DENTAL MEETING.

THE tri-state meeting of the State Dental Associations of Indiana, Ohio, and Michigan convened at the Dental Department of the Detroit College of Medicine, Detroit, Mich., on Tuesday, June 18, 1895, and was called to order by Dr. D. C. Harrold, president of the Indiana Association.

After prayer by Dr. J. Taft, of Cincinnati, Dr. THEODORE A. MCGRAW, president of the Detroit College of Medicine, delivered an address of welcome. Dr. McGraw, in the course of his remarks, humorously alluded to the influence which dentists have upon public affairs, instancing the law regulating the practice of dentistry in the state of Michigan, which the dentists were able to get through the legislature by terrorizing the members with the fear of the forceps, although the medical profession had failed to procure a law regulating the practice of medicine.

Felicitous responses were made on behalf of the Indiana State Dental Association by Dr. S. E. Harryman, of Lawrenceburg ; on behalf of the Ohio Association by Dr. W. H. Todd, of Columbus ; and on behalf of the Michigan Association by Dr. George L. Field, of Detroit.

Dr. S. B. BROWN, of Fort Wayne, Ind., read a paper on "Rhizodontrypy, or Hullihen's Operation," of which we give the following abstract :

Dentistry being the youngest of the learned professions,—but a generation removed from its birth in science,—its history has not the fascination of antiquity, but should be valued as profitable knowledge, as by comparison with vicissitudes attending its growth we can better appreciate the present and find encouragement for the future. Without historical knowledge, the recent graduate is liable to regard the invention of crown- and bridge-work as the grand dividing line between ancient and modern dentistry ; those of more extended practice will cite the discovery of coffer-dam and the dental engine as the period of separation between the false and the true ; those of still more remote matriculation will quote pulp-capping, root-filling, and cohesive gold foil as the first helpful light to their professional pathway.

He only of maturer years can lead in reminiscence to the welcome announcement of the discovery of atmospheric pressure for the retention of dental plates, and Hullihen's operation for the silencing of aching teeth. No subsequent discovery has been proclaimed with more joy than that with which the glad tidings rang out just fifty years ago that Dr. S. P. Hullihen, of Wheeling, Va., had devised an operation for the surgical treatment of dental pulps. This operation, which he called "Rhizodontrypy," consisted in drilling through the gum and alveoli, a line within the margin of the latter, into the pulp-canal, either before or after filling-operations for the relief of exposed or congested pulps. Where life remained, the purpose was to give vent only, wounding the pulp as slightly as possible, aiming to preserve its vitality, the gum acting as a valve for its further protection. The drill was usually driven with a bow and slack cord.

The American Society of Dental Surgeons and the dental journals of the time discussed the practicability of the operation with little adverse criticism, and, during its popularity, there were many claimants to priority in the discovery, though it was admitted generally that Dr. Hullihen first made it public. At the thirteenth annual meeting of the American Society of Dental Surgeons, August, 1852, Dr. C. O. Cone, of Baltimore, first brought the attention of the profession generally to Dr. Hullihen's discovery, accompanied by a paper on the subject by the latter, which was discussed and the idea warmly indorsed, as also in the dental journals.

The writer had revived this fragment of history because of its bearing on the problem how best to preserve the deciduous teeth. His early professional life had been contemporary with the later years of Dr. Hullihen's ; he had employed this operation until pulp-extirpation and root-filling supplanted it.

In the treatment of deciduous teeth with pulp-complications, he had, several years since, re-adopted the operation of rhizodontrypy, with modifications, the results being more satisfactory than with any other line of treatment.

The modus operandi consists in thoroughly removing the pulp-tissue or its *débris*, when exposed, when the cervix is perforated on the mesio-buccal surface one-sixteenth of an inch within the gingival border through to the floor of the pulp-chamber; the cavity being prepared, a disk of lead properly adapted is placed on the cavity-floor, to prevent obstruction to the vent which the perforation affords; then filling completes the work.

Thus treated, the organ of resorption performs its natural function without interruption, and childhood is dentally blessed to the limit of nature's plan.

In the treatment of pulpitis in permanent teeth, where extreme inflammation prevails, rhizodontrypy can be employed to great advantage over the method of drilling through crowns or fillings, as with it the minimum of vibration results.

### *Discussion.*

Dr. J. TAFT, of Cincinnati, was gratified that this subject, which had well-nigh passed from the memory of the profession, had been presented. The earliest account of the operation is given by Dr. Hullihen himself, in 1845. He practiced it from that time until his death, a number of years afterward, and, as he himself declared, with as good success as any other dental operation, perhaps the extraction of teeth excepted.

The operation consisted in simply perforating the root of a tooth into its pulp-chamber, wounding the pulp, thereby depleting it and causing its contraction. Although teeth having pulps exposed by decay were treated in this way, in a great many instances with decided success, the results were more promising where the pulp was exposed by excavation, where it was well-nigh exposed, but covered with a thin line of undecayed dentine. In these last cases, where the introduction of a filling would be likely to be attended with unfavorable results, he claimed that by the adoption of this method, in almost every instance, the pulp would be saved in a state of, to say the least, comparative health and vitality.

The operation was brought to the attention of the public more especially and pronouncedly at the meeting of the American Society of Dental Surgeons, held in Newport, R. I., in August, 1852, at which the speaker was present. It was regarded as a very decided step of progress in the treatment of exposed pulps. Prior to that time, the only resort for exposed and aching pulps was the forceps. Efforts to preserve exposed pulps by capping had been made; but the facilities were then so circumscribed that very little was accomplished, compared with what is now attainable by that method. Dr. Hullihen, in his presentation, emphasized the importance of careful discrimination in the selection of cases, speaking of the different susceptibilities of different individuals, pointing out that the same individual, at different times and under different conditions, would be differently susceptible to such operations as this.

Quite a number in the profession took up this operation, with varying results. For instance, in England, Mr. Hume, Mr. Cartwright, Mr. Harrison, and a number of prominent men of that day, according to their statements, as put upon record, were in the main successful, satisfactorily so; with some one case in every ten was a failure, others varying, in either direction, from that point. One man says, "I lose about one in every seven, after a year's time." In this country there was perhaps the same variation. Some operators on the continent, especially in France, and in Paris, claimed a good degree of success. In Australia Dr. Belisario employed this operation for a long time, and quite extensively.

So that many prominent men in the profession practiced this operation. But it has been abandoned, for one thing, because men will not take the care and pains to discriminate, will not examine the peculiarities and susceptibilities of the different cases presented to them as they ought to examine them, will not diagnose cases as they ought to diagnose them, and modify and regulate their treatment and management of these very delicate tissues according to these indications.

It is not an easy matter to pursue this investigation, to adopt a thorough and efficient diagnosis of these cases. It requires time and attention, and study and knowledge of the human organism. And in our hurry and every-day drive of business, to get as much through as possible, we are not disposed to follow out that line of practice. That is one reason why it has been abandoned. There is no money in it. We do things nowadays, the majority of us, according to the amount of money in them, and that is one of the curses of our profession. We do not stop long enough to investigate and to attain those high results which we might, because, forsooth, we are not paid for it. Well, why should we not be paid as well for saving a tooth-pulp alive,—be compensated for the time occupied,—as for filling a tooth or making an artificial set? It is a better service than making an artificial substitute or than filling a decayed cavity.

That is one reason why it has been generally abandoned, and not because it generally fails. It does not generally fail, if it is properly performed. What is involved in it? There are several things, in addition to those mentioned. The mouth generally should be in as healthy a condition as possible, and the operation should be carefully performed. A rude, rough performance of the operation will of course, in a great many instances, be attended with disaster. It should be skillfully performed, as the oculist performs his delicate manipulations upon the eye, and as carefully as many other delicate surgical operations are performed. When so performed, there will be a large measure of success.

At the time of this meeting at Newport, Dr. Hullihen claimed that he had performed this operation five hundred times, with very few failures. Dr. C. O. Cone, then of Baltimore, Md., and subsequently of Lexington, Ky., went to Dr. Hullihen, learned his method carefully, and made a report at Newport of fifty cases which he claimed had nearly all been successful. Of course, there are different ideas of success. Fillings that remain and prevent recurrence of decay for ten, fifteen, twenty, or thirty years are successful, and the greater the length of time, the greater the measure of success.

Prior to this meeting at Newport, Dr. Cone addressed a letter to

Dr. Hullihen, asking him to give certain information with regard to this operation, as follows:

1. A history of the origin of your operation for the treatment of exposed dental nerves.
2. A detailed description of the operation, the cautions to be observed in the performance of the same, and the instruments employed.
3. The symptoms attending and following the operation.
4. Indications and counter-indications for the operation.
5. Relative success and failure of the operation in general, and in different classes of teeth, and in the same mouth at different ages.
6. Pathological changes dependent on and affected by the operation or the philosophy of the operation.

To these, Dr. Hullihen replied at length in a paper read before the meeting and which Dr. Taft quoted in full. This paper was published in the *Dental News Letter* for October, 1852. Of course, Dr. Hullihen's reply, setting forth his own claims for this operation, ought to come to us with considerable force.

Dr. TAFT then referred to the controversy between Dr. Hullihen and Dr. S. F. Miller, whose operation he described as simply drilling in at the cervical portion of the tooth, at the edge of the alveolus, to sever the pulp in the crown from that in the root and destroy a portion of the root, hoping to have the pulp-tissue in the root remain alive. Dr. Miller finally came to the removal of it, claiming that that was better than to allow it to remain.

It has been a custom, from time immemorial, to drill into all cavities where there would be likely to be a discharge of matter, fluid or gas, so avoiding the irritation of its confined presence; a very different operation from the Hullihen operation in its aim.

The point brought out by Dr. Brown is very valuable,—namely, the drilling, occasionally, into the roots of temporary teeth, and with decidedly good effect, sometimes. The speaker has occasionally performed this Hullihen operation in all these years, not very frequently, not perhaps as frequently as he ought, as it might be employed many times by the intelligent, skillful operator, with decidedly good results. To those who care nothing about the operation, to those who are not readily able to make close discrimination and diagnosis, he would say, let it alone. Of course, we now have facilities for performing this operation that Dr. Hullihen never dreamed of. We have the dental engine, which can be delicately and carefully and skillfully used, and when the pulp-chamber has been nearly reached,—indicated by the first pain felt by the patient,—a drill can be taken in the hand, until the pulp-canal is opened.

This operation, like many others, has passed away, and has not been in the minds of many of late; perhaps has been regarded, by some who are not able to perform it rightly, as a failure and a fraud, but he thinks it might sometimes be returned to in proper cases.

Dr. W. C. BARRETT, of Buffalo. The question comes home to us here, have we, during the last forty years, been steadily deteriorating in our knowledge of pathology? If we have made any advance, then the subject of the paper, as compared with the practice of the present day, is as the old stage-coach compared with the railroad. Rhizodontrypy was just falling into desuetude when the speaker began practice. The extravagant claims made in behalf of this operation have been repeated over and over again in favor of every new fad that has been presented to the attention of dentists. He had heard some of the most intelligent and skillful practitioners in dentistry assert that they capped every exposed pulp, even in cases where decomposition had begun, and had partially destroyed the pulp, with a percentage of success of one hundred. He does not know why this operation should be raised from the sepulcher where it has reposed for so many years. We have learned enough to know that you cannot penetrate the pulp with a dental drill, or spear, or anything of that kind, without the most serious consequences. There is no time here to enter into a pathological examination of this subject; and in view of the discoveries of men like Pasteur, it is not necessary. From a historical point of view, of course it is very interesting. We are enabled to see the pit from which we were digged. We can see the heights to which we have risen, when we see the very slough from which dentistry has been extracted.

Dr. BROWN replied that he had brought, not the old stage-coach, but the beautiful, inviting tally-ho. He has not suggested the operation in connection with the permanent set, but simply in connection with the deciduous teeth, employing certain phases of the Hullihen operation.

Dr. BARRETT wished simply to say that the performance of this operation can be nothing more than the opening of a vent-hole, what is vulgarly called, in the East, a "stinker." It simply furnishes drainage. We know that, according to our pathological laws, there cannot under ordinary circumstances be any such thing as the recovery of a pulp after it has been pierced by the drill at the gum-margin. The instance cited by Dr. Taft, of a filling up of the hole by the deposition of osseous matter, must have been, of course, an extraordinary, exceptional case; it must have been a filling in by dentine, which is a product of functional activity, the action of the odontoblast cells; and it seems as though by drilling in, you must destroy those cells at that point. Where can the dentine come from, when you have destroyed the very cells whose functional activity deposits the dentine? He could not conceive how that could be so. He could conceive that calcific matter might have been poured in there and stopped it up, but it must have been the result of the disorganization and breaking down of the tissue.

Dr. LOUIS OTTOFY, of Chicago, believes the presentation of this subject is exceedingly valuable from the standpoint of history; but in all other particulars he must agree with the last speaker. He could see no reason why an attempt should be made to reintroduce this operation, and was satisfied that the essayist never intended we should resort to it in the case of permanent teeth, but that it should be confined entirely to the deciduous teeth. Hullihen undoubtedly deserves a great deal of credit for having, in such a primitive manner, saved as many teeth as he claims. The speaker seriously doubts whether one of those pulps remained alive. If it did, the climate and other conditions were different from those of to-day. The pulp of every tooth treated in that manner at the present time would unquestionably die. Furthermore, there is no need for reviving the operation, in view of the improved instruments we have. It is far simpler to treat children, as well as adults, than it was ten or fifteen years ago, to say nothing of the period at which Hullihen practiced. We can now open up pulps carefully with the electrical engine, without frightening or injuring the child in any special manner. We have so progressed that such make-shifts are not necessary. He has practiced the operation a number of times, but has never been satisfied with it; having merely used it as a scape-goat when not able to do anything better, years ago. But all of us can do better to-day.

But he is specially interested in the subject, because it relates to the saving of the deciduous teeth, a matter which the profession has neglected altogether too long, and which it is well to bring up and discuss more and more from now on. We can save the deciduous teeth as well as we can the permanent ones, and inasmuch as he feels that the pulp of a tooth treated in the way described in the paper must die, and that no resorption of the root can take place, there is no special object in filling a tooth in that way. A tooth can be filled with medicaments, if nothing else. He has recently taken up the saving of the teeth of children by means of gold and platinum caps, which is far simpler than it seems to be, far less painful, and far more readily borne by children than filling itself, because it does not require much preparation of the cavity. The impression can be taken quickly, and a cap stuck on which will stick to a surprising degree. The speaker's boy has a crown of that kind which he has carried for nearly a year. What he wished specially to say was that whatever looks towards the saving of deciduous teeth it is well to know.

Dr. H. J. McKellops, of St. Louis, cannot understand why that class of work has been done, having never yet seen a man who has been able to succeed in it. When you have filled one cavity, but have made another, what becomes of the microbes that attack that second cavity? What advantage have you? Where do you save the tooth? We must not simply relieve the patient for the time being, only to produce misery afterward. He is astonished that Dr. Taft should even listen to such a thing, which the speaker had watched closely, so that he feels that the operation is a flat failure. There is no use for any man to say he can put a plug on an exposed pulp, and then put another hole into that pulp, and that tooth never will trouble the patient. It is as much as the profession can do to save a tooth the pulp of which is not exposed; and we have not succeeded perfectly in that yet. We should not have this thing brought up to the attention of our young men, after fifty years, when it is rotten to the core. Dr. Brown has shown us some specimens of deciduous teeth. In three or four of them the roots are all absorbed, and the teeth ready to drop off. What is the use of putting a cavity into them?

Dr. Brown. They did not absorb until after they were filled.

Dr. McKellops does not see why the child should be tortured in this way. It takes all the genius a man has to get a child into a chair, to do the work we have to do, and it must be done gently, lightly, and if the parents have been properly instructed to have their little ones brought in and attended to, there is no earthly use of that. There is nothing better to save these teeth than a little oxid filling. If the cavity is properly prepared, you can put them in where everything else has failed, and if you will watch them, you will find not one particle of decay has taken place there. That is what we want to get at, instead of drilling into these cavities, and making these children suffer by the performance of this unnecessary operation.

Dr. BROWN. "No gentleman on this floor would denounce more heartily than I the performance of the Hullihen operation to-day. I was talking of the treatment of deciduous teeth, after the pulps are removed, and the canals cleansed, and had no reference to perforating teeth that had pulps, dead or alive. I have resorted to this for years, and it is a success above everything else, with me. What I am aiming at is the saving of deciduous teeth ; and by the process I refer to they are saved, and there is no inflammation in the root. The child can masticate, and the roots are absorbed and the teeth thrown off at the proper time. The teeth are saved, and if I am the only witness for it, why, I think the testimony of a man who knows something about a thing is always more competent before any jury than the evidence of many men who know nothing about it, who never have tried it. There are other gentlemen in the room who have tried it, and who have a good word for it. It has saved infant teeth ; but not after the plan that has been suggested in the discussion here, that it related to pulps remaining in the teeth. That has nothing to do with it. It is true there is a little accumulated fluid ; but silver nitrate can be used, so that the scent of decomposition is exceedingly slight, and the impurity will not amount to as much as we see in the mouths of the average children, where one or more cavities can almost always be found, that have been carried a year or more. We are aiming at the greatest good for the greatest number ; and if you ask for perfection, I do not claim that for it. It is the best I know of for saving children's teeth, the purpose at which I aim."

Dr. TAFT wished simply to explain that the presentation he had made was based upon the fact that Dr. Brown called his paper by the title "Rhizodontrypy," which gave him the impression that he was going more at length into the subject of rhizodontrypy than he did, and the matter was brought before the meeting on account of its historical interest. You cannot brush away the testimony of the men quoted, with any sense of propriety. It does not do to say that Dr. Hullihen, Dr. Cartwright, Dr. Belisario, Dr. Hume, and others, than whom none stood higher in their day, were ninnies and fools. He does not champion the miscellaneous employment of this operation ; but after all there is an education in studying old methods, sometimes. The operation which Dr. Brown has presented is a feasible one, notwithstanding the statement of Dr. McKellops to the contrary. There is something in it ; and to seal up the cavity, as he does, is the true way to avoid inflammation ; and by making this drainage, this escape, we remove a process that is taking place on the roots of the temporary teeth. The speaker knows it is practicable, for he had used the same method, time and again, with good results.

Dr. BARRETT then stated that he had examined the specimens, and found that, with a single exception, there is positive evidence of caries about every one of the openings.

The discussion was closed.

(To be continued.)

# AMERICAN MEDICAL ASSOCIATION—SECTION ON ORAL AND DENTAL SURGERY.

(Continued from page 603.)

## SECOND DAY—*Afternoon Session* (Continued).

Dr. GEORGE F. EAMES, of Boston, Mass., read a paper entitled,—

### THE RELATION OF ADENOID VEGETATIONS TO IRREGULARITIFS OF THE TEETH AND ASSOCIATE PARTS.

I invite your attention to a few preliminary statements as indicating my position in relation to the subject of which I am to speak.

1. While mouth-breathing is usually attendant upon adenoid growths, this is not always the case; while, on the other hand, mouth-breathing may exist without the presence of adenoids, or it may be due to a chronic hypertrophy of the turbinated bodies, or some septal deformity.
2. The adenoid growth rarely fills the pharyngeal space so as to obstruct breathing, but mouth-breathing *results* from the irritation which it produces.
3. Mouth-breathing does not produce adenoid vegetations.
4. Mouth-breathing does not cause irregularities of the teeth.
5. I have examined many cases presenting deformed arches and irregular teeth in which no adenoids existed.

It is argued by G. MacDonald that nasal stenosis is a constant factor in post-nasal growths, and that this being the case, "as long as respiration is conducted through the nose, there is, of a physical necessity, a diminution in the barometric pressure behind the seat of stenosis. This inevitably results in more or less overfilling of the blood-vessels, which, in its turn, leads to hypernutrition and hypertrophy."

It is obvious that, when the diaphragm is depressed, the mouth closed, and the nose partially closed, there is more or less suction produced which would invite blood in extra amounts to the pharyngeal region; but, according to my observations, patients breathe through the mouth, both by instinct and force of habit, even when it is possible to breathe through the nose. The swollen turbinates, with their rich supply of nerves, readily convey a sense of suffocation to the brain, and the mouth is immediately opened.

I have repeatedly found children breathing through the mouth, and, upon request to breathe through the nose, they have been able to do so, but as soon as their attention was drawn in another direction the mouth opened and mouth-breathing was continued. Moreover, the mouth opens so readily, upon so little provocation from the nasal irritation and stenosis, that it does not seem possible that sufficient "diminution of the barometric pressure" can be produced in the pharyngeal vault to cause a growth of tissue.

Again, if this be true, we ask why the growths are so often pedunculated while the pressure is exerted equally in all directions.

This view also necessitates nasal stenosis to begin with; but it is generally understood that the enlarged turbinates are the *result*, not the *cause*, of adenoids, and observation shows that the nasal obstruction gradually disappears after the removal of the growth.

Again, this will not account for the congenital growths, and those in infants whose oral respiration has only been established a few weeks or months; and still again, those cases of nasal stenosis of long standing in which there is no adenoid hypertrophy.

If it is true that this "diminution of barometric pressure" acts also to increase the size of the faucial tonsils, how shall we account for many cases of post-nasal adenoids in which the faucial tonsils are normal? Their growth and development is acknowledged to be on the same principle, they have physiological limitations in common, and it would seem reasonable to assign a cause common to both.

It has been said that adenoid growths in the pharyngeal vault cause irregularities of the teeth. I do not believe this to be the case, but rather that the dental irregularities are only another expression of the same cause that operates to produce the adenoid growth; in other words, there is one cause common to both, yet this cause may not be able in all cases to produce both. The bone developing vital movement may be strong and active by inheritance, while the lymphatic glandular system is weak.

Deformities of the hard palate, forming the dental arch, are frequently associated with adenoid growths, but not always, as many would give us to understand. There are various reasons given concerning the origin of these irregularities. For instance, it is said that a so-called high arch, or V-shaped arch, is a diagnostic sign of adenoids in the pharyngeal vault. The late Dr. F. H. Hooper, in his pamphlet on "Mechanical Effects of Adenoid Vegetations," says, "The hard palate, from the constant atmospheric pressure within the mouth, is pushed upward." It is difficult to see how there can be a constant pressure within the mouth while it is open and the air is free to move either in or out. The air must be confined in a given space, and a force exerted, in order that pressure in any given direction be made. Therefore we cannot believe that this deformity of the arch is due to atmospheric pressure caused by nasal stenosis.

The theory of David accounts for the deformity of the hard palate, in persons suffering from nasal stenosis, by a partial vacuum produced in the nasal cavities and upper pharynx by the act of swallowing. The atmospheric pressure remaining the same in the mouth, its roof is pushed upward. It is difficult, also, to reconcile this theory with the writer's view of the case. In the first place, it must be a rare case in which the nasal stenosis is so perfect that a partial vacuum should be produced behind it. Of course, it is well known that, in the act of swallowing, the tongue presses forcibly against the roof of the mouth from before backward; the soft palate is slightly raised; as the bolus of food, if any, passes it, the posterior pillars of the soft palate then contract on each side of the uvula, forming a nearly perfect valve, which, with the application of the posterior wall of the pharynx to the superior surface of the soft palate, forms a successful barrier, protecting the posterior nares.

The necessity of this, as well as proof of this function, is shown in cases of paralysis of the soft palate, in which liquids swallowed regurgitate into the nose. Now, the act of swallowing is momentary, and the muscles contract firmly, and it does not seem possible for this temporary diaphragm to be so pulled downward as to cause a partial vacuum in the nasal cavities; moreover, immediately after swallowing there is a reaction ; the breath being held during deglutition, it is expelled with some force through the nose or into the nasal cavities, the mouth being closed in the act of swallowing. If the air does not find exit through the nose, the mouth does not open until after considerable pressure has been exerted in the upper pharynx and the nose. This may be demonstrated by occluding the nostrils with the thumb and finger, and performing the act of deglutition.

Again, if deformities of the hard palate are caused by the withdrawal of atmospheric pressure on one side, and maintaining it on the other, it would seem that as the pressure bears on all parts equally, the palatal arch should be pressed upward equally high in all directions. This is not the case always ; for example, Model 1 shows the case of Mr. C., aged about thirty-nine years, with a large adenoid growth in the pharyngeal vault, but one side of the hard palate is much higher than the other side.

It has been stated that mouth-breathing necessitates a constant dropping of the lower jaw, which, in so doing, causes pressure of the masseter and other muscles upon the buccal surfaces of the upper teeth and consequent flattening of the lateral alveolar arches, and the projecting forward of the cuspids and incisors.

I cannot believe that the dropping of the lower jaw produces pressure on the teeth in the superior maxilla. The lower jaw is approximated to the upper teeth principally by the masseter, temporal, and internal pterygoid muscles, and when the jaw drops by the relaxation of these muscles, and with it other muscles and tissues of the face, unless the mouth be opened to the fullest extent by action of the platysma myoides, digastric, and other muscles, the tissues of the cheek are not put upon the stretch ; in fact, the finger can be easily passed in between the teeth and jaw, without being sensible of any pressure upon it, provided the mouth is not opened widely. Moreover, it seems reasonable to conclude that the jaw is held suspended, not by the cheeks, but by the masseter and accessory muscles.

The cheeks cover the jaws and teeth loosely, with tissue to spare, and will, as a rule, admit of the jaws being opened to a considerable extent without separating the lips or stretching the cheeks, which is the case during sleep ; therefore when the lower jaw relaxes sufficiently to let the air in through the mouth, it cannot put the tissues of the cheeks on the stretch, or draw them tightly against the teeth. Both observation and experiment will show that it is only necessary to open the lips slightly, in order to allow sufficient air to pass in by the mouth, and that all the tissues and muscles concerned are *in a relaxed and flabby condition while mouth-breathing is going on.* In order to demonstrate this, I have made a number of experiments, to determine the pressure of tissues and muscles against the teeth. The device which I have found most successful is one which I take pleasure in passing around for your inspection. The instrument will explain itself.

The use of this apparatus confirms my views as above expressed. Moreover, the anatomy of the parts involved bears the same testimony upon careful observation and study. Notice the fact that a straight line drawn from point of origin to insertion of these muscles would not touch the teeth. A profile view shows the fact that the masseter extends no farther forward than the second molar, while the other muscles concerned do not come as far forward as this. It has been suggested privately by several prominent gentlemen here present, that this demonstration was unnecessary,—that it is absurd to suppose that the pressure of the cheek causes a narrow arch ; but others have differed with me publicly, and I then made a vow that I would make a demonstration upon which my opinion would either stand or fall, and I think I have now done it, and that my opinions as expressed have been substantiated.

Bazin is quoted as advancing the idea that the weight of the tongue in the floor of the mouth would tend to expand the lower jaw beyond its normal limits. I would suggest, however, that if weight is the expanding force, how can it press laterally, since gravity would carry the tongue downward into the floor of the mouth, which would rather draw the sides of the jaw together than otherwise. But if it be the muscular force of the tongue, then it is easier to see how the teeth might be pushed outward.

But here is a case, Model 2, Mrs. H., aged thirty, with a history of mouth-breathing from infancy, with a marked contraction of the lower jaw, the bicuspids closing entirely inside their would-be antagonists. The nasal breathing is fairly free at the present time, yet mouth-breathing is continued, partly from habit, and partly from a mild chronic nasal catarrh. There are no adenoid growths or enlarged tonsils ; there may have been in early life ; but the one thing to be noted is, the habitual mouth-breathing did not expand the lower teeth in this case.

Dr. Henri Chatellier, of Paris, calls attention to the bones of the head and face consequent upon obstructed nasal respiration. He points out that the air-cavities, as the frontal, sphenoidal, ethmoidal, and maxillary sinuses, being normally in communication with the air, cease to develop when the circulation of air through the nose is interfered with, and hence dimensions of the face are altered. The only article on this subject written by a practicing dentist, which in any sensible degree reaches the truth and demonstrates it, is by Dr. E. S. Talbot, of Chicago. I believe the ideas which he thus expresses to be based upon a correct principle. Dr. Talbot says, "There are many cases of contracted arches where mouth-breathing does not exist ; there are also many cases of normal arches where it is present." I have cases, seen by a number of competent witnesses, to show that the above statement is entirely correct.

I now wish to present two cases, both having marked adenoid growths and consequent nasal stenosis and mouth-breathing, but the dental arches present a striking contrast. Models 3 and 4. Model 3 represents J. H., aged thirteen years, upon whom I operated November 4, 1893, removing a large quantity of adenoid tissue. In this case there was defective speech, the usual dullness and deafness. After the operation, the first improvement was shown in the hearing in two weeks; the speech was slightly better in four weeks ; and the nasal stenosis is decidedly lessened. The marked feature in this case is the broad and regular dental arch.

The other case, E. F., Model 4, aged nine years, was operated upon a week later. The symptoms were about the same as in the case just described, with the exception that there was very little deafness. Compare the dental arch with No. 3.

Marked adenoid growths are sure to produce mouth-breathing and more or less nasal stenosis ; but irregularities of the teeth and deformities of the arch are not at all certain to follow as a consequence, but are rather companions, due to a common cause.

Dr. Talbot further says that in most cases the cause of these deformities is an arrest of development of the bones of the nose, and this produces mouth-breathing. While there may be an arrest of development of the bones of the nose, I would call attention to the fact that the opposite condition exists as to the turbinated bodies, which are hypertrophied.

As long ago as 1879 there appeared a paper in the Philadelphia *Medical Times* by Professor Harrison Allen, in which he says, "Inasmuch as the face is the result of the lateral visceral half-arches joining the median structures, projected from the front of the brain-case, it follows that if there is want of harmony between the two genetic movements, errors of symmetry will readily occur."

Explanation may thus be given of asymmetry of the nasal chambers, the external nose, the two halves of either of the dental arches, entirely apart from the acquired defects in the same localities.

Applying this hypothesis to practice, Dr. Allen had recognized a well-defined group of cases in which the nasal chambers remained, from birth, partially or entirely occluded. Also that cases of obstinate nasal catarrh in children from seven to eighteen years of age, in whom the upper permanent incisors were overlapping and convergent, the two halves of the upper dental arch more or less V-shaped, the tonsils tumid, the roof of the mouth with a high narrow vault, the cause was deep-lying and congenital, and affected all the structures of the face. Dr. Allen has frequently noted the way in which the dental arch was narrowed and elevated in adults, in whom no history of either adenoid disease or nasal obstruction was given.

It should be noticed also that the upper incisors approach the vertical position, sometimes overlapping, in many cases of adenoid disease, while in thumb-suckers these teeth protrude from the mouth.

In a clinical lecture delivered before the First District Dental Society of New York, Dr. Allen describes a case which is instructive, showing the possibility of the Hutchinsonian, or an allied deformation of the teeth, occurring without a history of syphilis or scarlatina ; that oral respiration was established as early as the fifth year, due to a large adenoid growth ; that the teeth were congenitally deformed ; that this congenital deformation could hardly be caused by oral respiration established at the fifth year. The following is a description, and remarks concerning the above case as given by Dr. Allen :

"A lad in his tenth year lately came under my observation for difficulty arising from oral respiration. He was the son of respectable parents. The father denied the taint of syphilis, and did not exhibit, upon examination, any sign of the disease. The child's mother died of phthisis a short time after his birth, and he had been brought up most carefully and intelligently by a nurse, who is acquainted with his clinical history from the time he was born. The child has always been delicate, especially in the functions of digestion and assimilation of food, but there was entire absence of the ordinary signs of syphilis. There was no deformation on the top of the head (which has been described as natiform). There were no fissures in the skin at the nostril, or at the angles of the mouth, no cloudiness of the cornea, no traces of previous eruption of the skin, nor evidence of periosteal disease. At the fifth year it was observed that oral respiration became established, and there was also a disposition to take cold easily. Examination of the pharynx revealed the presence of a large adenoid growth pendent from the roof. The palatal arch was high and narrow, the obstruction to nasal respiration was absolute. The nasal septum was irregular, apparently due to enormous thickenings of the maxillary crests. The teeth presented all the characters of the Hutchinsonian deformity, excepting only that the lateral incisors were not pegged. After the removal of the adenoid growth, nasal respiration was re-established. Now what, in all probability, has been the order of events in this case? The clinical condition which brought the child under my care was not announced until the fifth year. Evidently this was not the first factor. So far as the shapes of the teeth are concerned, they must have arisen at a period certainly not later than at the time when the enamel-organs and the dentine-bodies were being adapted one to the other. In a word, the shapes of the teeth, as seen at the tenth year, were congenitally deformed. Secondly, the maxilla, especially in the alveolar region, must have been changed by the presence of these malformed teeth. It is scarcely likely that the establishment of oral respiration at a period so late as the fifth year should cause an elevation and narrowing of the palatal arch, and hyperostosis of the maxillary crests. If this position be accepted, a narrowed, high, palatal arch, with thickened alveolar processes, would be just as apt to arise because of prenatal forces (the same which caused the deformation of the teeth) as to be created by the establishment of oral respiration.''

We have leaned too much toward the faulty function last named, in attempting to explain this deformation, and not enough, at least in my judgment, to causes which are in operation at the time the teeth are being developed in the maxilla.

Gentlemen, the evidence is all in. I only wish to call your attention to other models which I pass around ; they are all cases in which large adenoids were present. You will notice that a number of these casts show a fairly well-formed arch. I may say also that I have operated upon many other cases, removing a large quantity of adenoid tissue, in which the arches were well formed. I make this statement to show what has not been shown before, to my knowledge : namely, that a large number of adenoid cases present well-formed dental arches.

I had hoped to present several hundred models, at least, in order to get some idea of the proportion ; but I must say, with reluctance, that I have so far failed to find that broad and generous spirit manifested which I expected to find in the heads of departments in hospitals.

It was my wish to obtain casts of the teeth in all adenoid cases, as they presented, without regard to the support of any preconceived theory ; but I found that this idea would conflict with views already advanced by certain ones in authority, and I thus failed to meet with the co-operation which I expected. The cases which I show you, from my private practice, are, of course, not sufficient in number from which to draw conclusions as to proportion of well-formed arches in adenoid cases.

Dr. W. S. TWILLEY, of Baltimore, Md., read a paper, of which an abstract follows, entitled,—

## DISEASES OF THE SOFT PARTS OF THE MOUTH AND ILL-DEVELOPED JAWS.

Among the causes of irregularity of the teeth is the resistance offered to the proruption of the permanent teeth by the temporary ones.

Another frequent cause is a want of simultaneous action between the increase of the permanent teeth and decrease of the temporary ones by the absorption of the roots of the latter. When the permanent teeth are large and the growth of the jaws does not proceed proportionately, the teeth are found to crowd and overlap. By the premature extraction of the temporary teeth the jaws are liable to contraction; and when the permanent successors appear, there not being sufficient room in the arches, they will crowd and overlap. Frequently for the want of space, one or more of the permanent teeth will not appear until late in life, and then only when room has been made by the extraction of one or more of the permanent teeth. In some cases they never appear at all. The protruding lower jaw is at times produced by children sticking out their chins to "look funny," as they style it. This is done in their play, and finally becomes a habit, producing a deformity, although this deformity is more frequently produced by the injudicious extraction of some of the upper teeth without taking care to secure a due proportion between the upper and lower jaws. Again, where the upper incisors extending inward come in contact with the lower centrals on closing the jaws, the child finds it easier and more comfortable to throw the lower jaw forward. This finally becomes habitual, and promotes the increase in the length of the lower jaw itself. The almost universal acceptance of the theory that the premature extraction of the deciduous teeth or the extraction of the permanent ones are the only causes of irregularities, is a great error in the opinion of the essayist. The prolonged use of the "fraud" and the greater evil of thumb-sucking are to be regarded as more serious causes of deformity. Enlargement of the tonsils and hypertrophies of the nasal chambers interfere with proper respiration. As a result, respiration is carried on more or less through the mouth, which results in a slight contraction of the muscles about the nose and mouth, which helps to increase the deformity of the oral arch.

The nasal septum being rarely perpendicular, is deflected to the one side or the other. Only in skulls with the flat or normal palate is the nasal septum most apt to be perpendicular, but in those having the inverted V-shaped palate either the septum must be greatly deflected or pressure upon the vomer will push the perpendicular plate of the ethmoid bone forward, thus causing that external protrusion characteristic of the Roman nose.

The cause of this abnormal formation of one of these structures *pari passu* with that of the other is ascribed by Professor Allen to "an inflammatory condition of the walls of the oro-naso-pharyngeal space, this producing tension of the muscles, thus pressing the lateral portions inward, contracting this space, thereby deforming the roof of the mouth and changing the natural dome shape to the inverted V shape. It is therefore important that we recognize and early in life guard against the evil results of the inflammation of the antrum and throat in children, troubles generally described as catarrh and tonsillitis.

As will be readily seen from the models here shown, which are very familiar types to us all, many cases of irregularity are due to neoplasms and hypertrophies, as these growths in children cause a diminution of the normal contour of the oral cavity as well as that of the nasal.

Before we, as dentists, can hope to meet with success in our treatment of such cases, the nose and throat should receive attention. We can sum up the whole in a few words. With the advance of civilization, there is a decrease in the size of the facial and maxillary bones; and the laws of inheritance, confirmed by common observation, show how constant is the mingling in the offspring of the traits of character and the peculiar features of two diverse races brought together in marriage. This mixture, without blending or harmonizing, is productive of deformity in character and physique.

Dr. R. R. ANDREWS, of Cambridge, Mass., read a paper, of which we give an abstract, entitled,—

## CALCIFICATION OF THE TEETH.

I have been somewhat in doubt whether I have enough new subject matter to warrant the presentation of a paper on this subject before the dental section; nevertheless, a brief review, giving the results of my more recent investigations and also questioning some of the published statements on this subject by recent writers, may justify its appearance. Calcification has always been a difficult subject, and authorities have been much at sea concerning the finer processes which Nature takes to fashion the fully-calcified substance. Calcification is a process by which organic tissues become hardened by a deposition of salts of lime within their substance. In the intercellular tissue and in the substance of the cells themselves these salts are deposited by the rich blood-supply always near. They are deposited in minute particles, and in such fine sub-divisions that it makes it difficult to demonstrate many of them, even with the higher powers of the microscope. The intercellular substance, either a protoplasmic or gelatinous fluid or semi-fluid, contains the lime particles. In it they change their chemical nature, uniting with the organic substance of the part, and form small globular bodies, which have been called calcospherites; and these, blending or coalescing into a mass, form a substance called calco-globulin. This calco-globulin, which is a lifeless matter, has been deposited through the cells into a gelatinous substance, and in some cases into the substance of the cells themselves, where, by a further hardening process, it becomes the fully-calcified matrix.

Most of us are more or less familiar with the experiments of Mr.

Rainey, and later of those of Professor Harting and Dr. Ord. But, as an essay on this subject would not be complete without a brief quotation, I introduce some of their experiments. "If a soluble salt of lime be slowly mixed with another solution capable of precipitating the lime, the resultant lime-salt will go down as an amorphous powder and sometimes as minute crystals. But when the lime-salts are precipitated in gelatin or albumen, the character of the lime-salts is materially altered. Instead of a powder, there were found various curious but definite forms, quite unlike the character of crystals or powder, produced without the intervention of the organic substance. Mr. Rainey found that if carbonate of lime be slowly formed in a thick solution of albumen, the resultant salt has changed its character: it is now in the form of globules, laminated like tiny onions. These globules, when brought in contact with one another, become agglomerated into a single laminated mass, it appearing as if the laminæ in immediate apposition had blended with one another. The globular masses, at one time of mulberry-like form, lose the individuality of their constituent smaller globules and become smoothed down into a single mass or layer, and Mr. Rainey suggests, as an explanation of the laminated structure, that the smaller masses have accumulated in concentric layers, which have subsequently coalesced; and in the substitution of the globular for the amorphous or crystalline form in the salt of lime, when in contact with organic substances, Mr. Rainey claims to find the clue for the explanation of the development of shells, teeth, and bone.

At a more recent date, Professor Harting took up this line of investigation and found that other salts of lime would behave in a similar manner, and that by modifying the conditions of the experiment very various forms might be produced. The most important addition to our knowledge made by Professor Harting lay in the very peculiar constitution of the "calco-spherite," by which name he designated the globular forms seen and described by Rainey. That these are built up of concentric laminæ, like an onion, has already been stated, and Mr. Rainey was aware that albumen actually entered into the composition of the globule, since it retained its form even after the application of acid. But Professor Harting has shown that the albumen left behind after treatment of a calco-spherite with acid is no longer ordinary albumen; it is profoundly modified, and is become exceedingly resistant to the action of acids, alkalies, and boiling water. For this modified albumen he proposes the name calco-globulin, as it appears that the lime is held in some sort of chemical combination, for the last traces of lime are retained very obstinately when calco-globulin is submitted to the action of acids. Now, it is a very remarkable fact that microscopic glistening specks and globules are constantly seen at the edges of tissue where enamel, cementum, dentine, or bone are to be formed or are forming.

Robin and Magitot have described isolated spherules of lime-salts as occurring abundantly in the young pulps of human teeth, as well as those of other animals, and Tomes suggests that perhaps all deposits of lime-salts commence in this way. These microscopic, globular bodies have been called calco-spherites, and it appears as though some such process as described by Professor Harting is transpiring within the substance of the tissues where bone, dentine, or enamel is to be formed. It will be noticed that near this point of formation there is always to be found a rich capillary blood-supply, and from this the lime-salts are given out. As I have said, near the forming matrix the tissue is seen to be full of these microscopic, glistening bodies,—the minute atoms which are often spoken of as granules. The abundant appearance of these globules at the time of the formation of the enamel, and their entire absence at earlier stages, is to me an indication that the globules are an enamel-substance, the matrix-forming calco-spherites ; and following up their future confirms this. Many of them are so small as to be scarcely measurable ; they are almost always spherical. The lower part of the cell toward the dentine contains the larger globules.

The growth of the enamel-rod, once begun, takes place by additions of these globules. I am convinced that the larger ones are composed of hundreds of the smaller ones, which have coalesced into the main mass. When enamel is commencing its process of calcification, if we examine carefully with high powers a tissue that has been properly prepared, so that there shall be the smallest amount of shrinkage, we shall find, in that slight amount of the enamel-organ that is directly over the calcified point of dentine, in what remains of the stellate reticulum and in the stratum intermedium principally, a very large number of glistening points. Most of these are minute,—microscopic, in fact. They are the forming calco-spherites, or, rather, they are the minute particles of lime from the blood-supply, changing their chemical nature as they pass into the protoplasmic juices of the part. These appear to be passing into the formative cells, and these cells superintend their formation into enamel-rods,—that is, they are laid from the cell against the forming rod. Within the substance of the ameloblasts they are seen to be growing larger by the smaller ones coalescing with others. If at this point of their development the layer of enamel-cells is pulled away from the cap of formed dentine, we shall see that the cap of dentine is everywhere covered with quite regularly formed globular bodies. If, on the other hand, the layer of enamel-cells is against the formed cap of dentine, the masses are assuming block-like forms, as though taking the form of the future enamel-rod. They appear to be in a gelatinous substance which is between the dentine and the enamel-cells, and here, by an unknown chemical hardening process, they become the hardened columns of the enamel, as I have formerly described in a paper read at Berlin, 1890.

In dentine the calcifying process goes on in much the same manner. The odontoblasts are merely masses of protoplasm, and appear to have no membrane ; as is the case with the ameloblast, it has a nucleus at a point farthest from the calcifying matrix. In forming the dentine matrix, the odontoblast, or the pulp-tissue through the odontoblast, gives out a rich gelatinous substance about as wide as the layer of odontoblast-cells. Everywhere between the odontoblasts, as Mummery has demonstrated, is found a rich supply of connective-tissue cells, whose function appears to be the forming of a net-work of connective-tissue fibers into this gelatinous substance, this net-work seeming to be a scaffolding upon which the calco-spherites, which are to form calco-globulin, are to be deposited. Into this layer the odontoblasts are also superintending the placing of the minute globules which are within them, and which have been given to them by the rich blood-supply found everywhere near their pulp-ends. Into the gelatinous substance the globules form against the calcified matrix, where, fusing with others, they form a mass, entirely filling the gelatinous substance. This gelatinous substance, with its mass of globules, now becomes calco-globulin. By some natural hardening process it then becomes calcified matrix, and thus another layer of calcified matrix is formed.

We must remember that it takes a large number of sections to show these various stages of growth. Each section shows the picture at the point where death of the part has left it, another section will show another stage, and so on. In one section we shall see the odontoblasts against the gelatinous layer, with the globules within it. Another section will show an entire absence of the gelatinous layer, with pear-shaped cells a little away from the calcified matrix and with portions of cells clinging to the calcified matrix, found here and there, that look like odontoblasts. Another section will show the globular masses filling up the gelatinous layer just before a new layer of calcified matrix is formed. It is only by studying these various stages of growth that we can come to any correct conclusions.

In the cementum (a tissue I have not studied as carefully as I have the others) I am convinced that the calcifying process is much the same. The first cemental calcification takes place by the cementoblasts giving off these globular bodies near the neck of the tooth against the forming dentine of the root into a gelatinous substance, this also being given off by the cells. It assumes the form of plates or scales. Afterward the cells themselves appear to fill with the globules, and lose their identity in the forming matrix. That peculiar tissue which we call "tissue on the borderland of calcification" is composed of globular, glistening bodies which have coalesced and formed a layer within a gelatinous substance previously given out by the formative cells. In this condition it is a tissue indestructible both in acids and in caustic alkalies, and only in this condition is it true calco-globulin.

The conclusions here given on the subject of calcification are arrived at after many years of original investigation, made at such times as could be spared from a busy professional life. They are, I believe, with slight modification, accepted by most of the more recent authorities. It is my object to have presented my views in as clear and simple a manner as possible, that I might enable those of us who are not intimately familiar with the natural processes concerned in calcification to form a clear idea, that they might draw their own conclusions, as I shall review very briefly some of the, to me, erroneous views presented in a very recent work. I refer to a work entitled "The Anatomy and Pathology of the Teeth." The author and his associates, in a chapter describing "The Calcification of the Enamel," make these statements :

They observe, "The more we turn to the center of the cup (enamel-organ) the more shall we be struck by the presence of glistening, homogeneous lumps in the epithelia, until we have reached the center of the cup, where we observe that epithelium has been transformed into a number of such lumps in a regular arrangement, which reminds us of their origin from previous epithelia. The original epithelia (enamel-cells) gradually become enlarged, and are at last split up into a number of medullary corpuscles.'' Again, '' Medullary tissue develops into connective tissue of a decidedly fibrous character.'' Again : '' There is good reason for the assumption that the medullary tissues sprung from the previous external epithelium (of enamel-organ) is the source for the completion of such enamel as we observe upon temporary teeth when they emerge from their sockets.'' And again : '' If we examine the lower edge of the cup of the enamel-organ at about the sixteenth week of embryonal life, we observe a peculiar change in the columnar bodies of the internal epithelium, which consists in the appearance in a more or less row-like arrangement, of highly glistening globular bodies, replacing the previous columnar epithelia. These bodies are either solid or slightly vacuoled, and are formations of living matter such as we are accustomed to look upon as medullary, embryonal, or indifferent corpuscles, in their earliest stages of appearance. Obviously, these glistening globules have originated from the reticulum of living matter of the columnar epithelia (enamel-cells) themselves. We feel justified in this conclusion from the fact that we can trace step by step the growth of these glistening granules up to the formation of glistening lumps such as we have termed medullary corpuscles. . . . The lumps, I wish to repeat, are extremely glossy, with a high degree of refraction. They are arranged at first irregularly in a layer of considerable breadth, and higher up in rows, and by their coalescence and prolongation give rise to small columns, the ameloblasts. . . . These (medullary) corpuscles or the liquids contained in their reticulum become solidified into basis-substance and immediately infiltrated with lime-salts. . . . The enamel-rods are built up of such calcified or petrified medullary corpuscles.''

These observations in regard to the calcification of the dentine endeavor to show that the odontoblasts are split up at their distal ends into these glistening bodies, which they call medullary corpuscles. '' These medullary corpuscles are lumps of protoplasm, in which living matter is stored up in different shapes, the glistening globules of small size having arisen from protoplasm, and that these represent a juvenile condition of living matter in its most compact aggregation, which enter directly into the formation of the basis-substance of dentine, while at the same time, continually superadded to the proximal ends of the odontoblasts, are medullary corpuscles derived from the living matter of the papilla. Thus the continuity of the odontoblasts in dentine is established.'' They assert a similar proceeding from the ameloblasts, in a reverse direction. Thus, '' the ameloblasts being broken up at their proximal (dentine) ends into medullary corpuscles, which are directly transformed into blocks of enamel-rods, are superadded to at their distal or peripheral ends by medullary corpuscles derived from the stratum intermedium.'' . . . '' The indifferent corpuscles, serving to supply additions to the ameloblasts, exhibit all intermediate stages between small, globular, glossy, and compact nucleated, protoplasmic lumps.'' . . . '' Nothing but a transmutation of solid, globular lumps of living matter in delicately reticulated medullary corpuscles seem to be required for the building up of the minute blocks of the enamel-rods without the intermediate stage of ameloblasts. . . . The first appearing enamel is made up of irregular, angular, glistening lumps, greatly varying in size.''

In these few selections from a chapter in this work on "Calcification," I have given some of the points which they present, and these I propose to briefly review. No one can be more clearly aware of the patient and persistent effort, and of the immense amount of labor and earnest research which the author has given to his work than myself, and great credit from his profession is due to Dr. Bödecker for this labor. I am not in accord with his views as to calcification of the dental tissues, or the views of his master, Professor Heitzmann, or of Dr. Abbott, on this subject. To some of us, "the reticulum" and the "medullary corpuscles" are bugbears. We are familiar with, and have had many a conflict over, these peculiar theories. To the earnest investigator, who did not know the author, it would seem from their description of the calcifying processes as if a tissue had been built up to fit a theory. So far as I am aware, photo-micrographs of these tissues, as described in this chapter on calcification, have never been shown. There is no absolute evidence to prove the correctness of their assertions. Heitzmann, as an illustrator of histological or pathological tissue, is an artist, but however beautiful these drawings may be, the photo-micrograph is the picture with the stamp of truth that is convincing. The charge of "personal equation" could not be made in such an illustration.

These peculiar theories on the calcifying processes cause a very considerable amount of doubt in the mind of any one who has given this subject attention in the way of original investigation. The theories advanced clash strangely with facts. The glistening bodies seen in the epithelial layers of the enamel-organ are but lifeless lime-globules, and do not have their origin in a reticulum of living matter in these epithelial layers. Their origin, as I have stated, is more probably from the blood-supply which is everywhere abundant near these layers. It is speculating in a very lively manner to assert that the cells in the enamel-layers split up into a number of medullary corpuscles of a fibrous character and then become formations of living matter, and it is wholly a hypothetical statement to make when they say that these glistening bodies, by coalescing and prolongation, give birth to the ameloblasts. Their lumps of living matter, which they call medullary corpuscles, are but glistening masses of lifeless matter, known to be calco-globulin. They are not medullary corpuscles; they do not arise from protoplasm; they are not "a juvenile condition of living matter in its most compact aggregation." I wish to repeat: These so-called glistening medullary corpuscles represented in their illustrations are nothing more or less than lifeless lime-globules.

Many years have passed since these peculiar views have been given to the world, yet, so far as I have been informed, they have never been accepted by any authority of note. On the other hand, there are very many who reject their teachings and who honestly regret that this work should have been adopted thus early as a text-book in any of our colleges. It has a very considerable value, and this value is solely as a work of reference and comparison in the library of the investigator. This whole chapter on "Calcification" is decidedly out of harmony with the teachings of modern investigation, and it seems to me to be unwise, at this early date, to place such a work before our students as a text-book.

Dr. Andrews's paper was illustrated by a large number of lantern slides of photo-micrographs, showing the minute structure of the enamel and its development in the fetal organs.

On motion, the discussion of the papers of Drs. Eames, Twilley, and Andrews was deferred till the afternoon session of the next day, and the session adjourned.

(To be continued.)

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# UNION CONVENTION OF THE WASHINGTON CITY DENTAL SOCIETY AND THE MARYLAND STATE DENTAL ASSOCIATION.

(Continued from page 621.)

### FIRST DAY—*Evening Session.*

THE convention was called to order at 8 P.M.; Dr. J. Roland Walton in the chair.

Dr. WALTON introduced Dr. WM. H. WELSH, professor of pathology at the Johns Hopkins University, who delivered a lecture, of which an abstract follows, on

### BACTERIA OF THE MOUTH.

The human mouth contains a great number and many varieties of micro-organisms, the vast majority of which are incapable of injurious effects; others, under certain circumstances, are productive of disease. Many varieties have their natural habitat in the oral cavity and are not found elsewhere; others are introduced with food or with water or from the air. To study the micro-organisms of the mouth, it is necessary to scrape from the mucous membrane or from about the teeth the secretions in which they will always be found, though much more numerous in mouths that are not carefully kept clean. Pure cultures of such of the bacteria of the mouth as will exist upon what are called culture-media are made by inoculating the medium with the sputa. After a reasonable time, upon examination, the culture-material will be found covered with colonies of the different bacteria, and by inoculating new plates of culture-material from these colonies we get what are called pure cultures, that is, plates containing only one species of bacteria each. The colonies appear as whitish or grayish-white spots.

A very interesting point is the discrepancy between microscopical examination of the sputa and of cultures. The sputa contains many varieties of micro-organisms that are incapable of growth on our culture-materials. No other mucous membrane harbors so great a number or so many varieties of bacteria as the buccal; as this orifice is the main channel for all that enters the body, many varieties of micro-organisms are introduced, most of which tarry there but a short time, as they cannot assimilate the nutriment found there. Some, however, survive a long time, and there are others which have their natural home there and are not to be found elsewhere. We speak of these as the constant inhabitants of the mouth. The most important of these are the Leptothrix buccalis and the two species of spirilli. These are found invariably, and, as far as we know, they are harmless. A possible exception may be the leptothrix. It is found regularly in carious teeth and in abscesses in the mouth and in various forms of tonsillitis, but that it is capable of setting up any of these diseases is more than doubtful. These are all incapable of growth in culture-media. In the sputa, they are shown by the microscope. There have been statements by bacteriologists that they have cultivated them, but this has not been proved to the satisfaction of most of those interested in this branch of research. There are other bacteria which are disease-producing. The secretions and conditions of the mouth are exceedingly favorable to the growth of many species, but to some they seem to possess bacteriacidal properties. We have not, as yet, any very satisfactory demonstration of the reason for the disappearance of some species of bacteria which are frequently found in the mouth.

Bacteria do not penetrate the saliva-ducts or glands, nor, though present in the intestines, do they ever penetrate the bile-ducts to the liver.

One of the most important of the bacteria which cause diseases is the pneumococcus. This is always present in certain diseases, and is found sometimes in a virulent state and sometimes in a non-active state where there is no disease. In a virulent form, it is perhaps in one in about four or five healthy mouths. It will cause death if injected into a healthy rabbit, and pure cultures of it will be found in the blood of the rabbit. It is this particular organism which has caused the belief of the toxicity of the human saliva. It is probably found in all mouths in a non-virulent form, and special conditions of the mouth may favor a change from the non-virulent to the virulent state. This pneumococcus is always found in, and is supposed to be a cause of, croupous pneumonia and cerebro-spinal meningitis, though there must be special conditions to cause death or disease from its action or presence.

A second micro-organism is the Streptococcus pyogenes, a spherical bacteria growing in chains like pearls on a string. These are found, I think, in all mouths, or at least a very large proportion. Inflammations of throat and tonsils, pseudo-membranous forms of disease, pleurisy, erysipelas, cellulitis, and such types of inflammation are due to its action, and I believe it is especially concerned in caries of the teeth. The cause of caries has not been certainly and definitely settled, but these bacteria apparently are concerned. It has to do, also, in inflammations around the teeth. There are other pyogenic bacteria in such inflammations, but these are always present. They, too, are found in virulent and non-virulent states. Their virulence is determined by the test of inoculation into animals.

The tonsils are particularly vulnerable points to attack of bacteria, especially in unhealthy conditions of the mouth, and in septicemia and blood-poisoning. In diseases such as scarlet fever the bacteria invade the whole system. The oral pyogenic staphylococci are not constant inhabitants of the mouth ; they are universally diffused, produce boils and inflammations of external parts, and are what the surgeon guards against with his antiseptic precautions. Many other species of bacteria are less important ; the variety found in abscesses communicating with the mouth is astonishing. Some disease-producing bacteria are found in the mouths of healthy persons ; for instance, the diphtheria bacillus is found to inhabit healthy mouths without the person suffering from the disease, though whether such person is incapable of transmitting the disease to others whose system is in a favorable state for receiving it is a question as yet unsettled. The tubercular bacillus may also be found in the secretions of the upper air-passages. It has been discovered by Strauss in the nasal secretions of nurses and students, all of whom were healthy. This proves that it depends upon predisposition in the individual to become dangerous. The relations of bacteria to the diseases of the mouth and the teeth is a subject of itself, and my special knowledge of these diseases is not such as to justify my entering into it.

The question of the practicability of disinfecting the mouth is doubtful. It is difficult to disinfect the human skin, and we can apply disinfectants to it which would be dangerously strong if applied to the mouth ; but yet we can do something, and should do what we can ; as, in surgery, the surgeon cannot accomplish complete antisepsis, still it is his duty to do as much as possible. Cleanliness alone will do much for the mouth, and the use of a suitable wash, with a brush, may be recommended. Of course, the dentist should practice as careful antiseptic measures in regard to the state of his instruments as the surgeon does.

Bacteria closed up in teeth that are filled will probably do no harm, and, indeed, metallic fillings are antiseptic. As Dr. Miller has shown, pure gold, zinc, and tin are antiseptic. This can be and has been proven by inoculating plates with different kinds of bacteria, and placing the metals to be tested on the surface of the media. In twenty-four hours there will be colonies of bacteria covering the culture-media, except in the neighborhood of the metals, around which will be zones of varying width, in which no bacteria have developed. The antiseptic action is due to salts of the different metals which have been formed. Silver is more antiseptic than any other metal thus tested ; it will generally be surrounded by an aseptic zone of a half-inch in width.

### *Discussion.*

Dr. M. W. Foster, of Baltimore, would have liked more definite information about the question of bacteria in relation to the causes of decay in the teeth. Do they destroy tooth-structure, or do their excreta effect the destruction? He felt sure that they were responsible in some way, either primarily or as aiding in producing caries. He asked whether the saliva tested was taken directly from the glands or from the mixed saliva of the mouth ; the latter has an acid element not found in that taken directly from either gland. He doubted that cleanliness would make a mouth aseptic.

Dr. G. H. Claude, of Annapolis, asked about the green-stain often seen on children's teeth and sometimes on those of adults. He did not know, but supposed it was bacteria. When such stains are removed from a child's teeth the teeth will be found chalky, as if eaten by tincture of iron ; they are evidently a cause of decay. He desired to know what the stain is. It can be removed by carbolic acid and more rapidly by hydrozone or peroxid of hydrogen, but will return in two or three days.

Dr. B. Holly Smith, of Baltimore, said it was a satisfaction to know that the materials used in filling teeth had a desirable quality as antiseptics, beside merely filling the cavities. According to the "American System of Dentistry," the only filling-materials which we use that have antiseptic powers are tin, copper, and oxychlorid of zinc. It is to be regretted that we, as members of the dental profession, do not study these questions scientifically, as they have been presented to us to-night. We should make our own experiments, so as to prove the accuracy of the observations of others and strike out in new fields of discovery.

He would like Dr. Welsh to explain how such a metal as gold could have an antiseptic effect, as it is supposed to be absolutely insoluble in the fluids of the mouth.

Dr. J. B. RICH, of Washington, said the address had been full of valuable suggestions to the dentists; they have abundant opportunities to follow up the line of investigation, and in the march of dental science should not neglect them. While we are under great obligations for this lecture, we are not prepared to discuss the subject.

Dr. W. G. A. BONWILL had had no experience in this line of research, nor could he see that what had been done had been of practical benefit to dentistry. It had not given them a single new weapon of defence against the decay of teeth. He would be glad if it was possible to get hold of these wretches and destroy them, and thereby destroy dentistry itself; but the way to do this has not as yet been discovered. He had been for forty years practicing preventive treatment. He described the case of one patient whom he had been treating for that length of time, and whose teeth were worthless when he began, but none of the teeth had been lost since then. From one of the cuspids he had removed every part of the enamel, and from the first bicuspid most of it, yet these teeth stood thirty-six years without any decay. Then a slight cavity of decay showed in one, just above the gum, which he filled; and the next year another small cavity near the apex; since then there was no more decay. He can take all the incisor teeth in any mouth, wait till decay has commenced, and remove the stagnation from between the teeth, place the rubber-dam, saturate the cavities with chloroform, and put paraffin in, and the decay will stop; even the largest cavities can be treated in this way successfully. We need to remove stagnation from about the teeth and destroy capillary action, and we will prevent decay. We need not wait for bacteriologists to tell us how to save teeth from decay; what we want is to prevent the decay.

Dr. WELSH, in closing the discussion, disclaimed special knowledge of dentistry. In reply to the question of Dr. Foster, he said the secretions of the glands are sterile, and to find bacteria you must examine the mixed saliva of the mouth. Bacteria do not act mechanically in destroying the teeth, but chemically by producing acids, and the acids which affect the teeth are almost certainly fermentative acids, produced by bacteria. As has already been said, there is no specific bacteria of caries. The production of caries depends both on predisposing causes and on the presence of bacteria. By way of prevention we can do more to remove the predisposing cause than we can to fight the bacteria.

Referring to Dr. Claude's query as to the green-stain on teeth, he said he did not know it. To Dr. Smith's question he said that pure gold was the least antiseptic of all the metals. No doubt the metals are dissolved to some extent by the culture-media. He did not know whether the conditions surrounding the fillings in the mouth would dissolve the metals in the same way; unless this was proven, the facts shown by the experiments would have no bearing on dentistry. Dentists should actively investigate this field; they would certainly be rewarded.

On motion of Dr. WILLIAMS DONNALLY, a vote of thanks was tendered Dr. Welsh for his lecture, and the subject was passed.

(To be continued.)

[In Dr. Drew's paper, "A Case of Masking," line 11, page 621 of our July issue, for "backed" read "barbed."—ED. DENTAL COSMOS.]

## COLORADO STATE DENTAL ASSOCIATION.

THE Colorado State Dental Association held its annual session in Denver, June 18 to 21, 1895. It was a very interesting session, with instructive papers which brought out considerable discussion. The attendance was very good. Dr. McMillen, of Kansas City, gave some very interesting clinics. The following officers were elected: H. A. Fynn, Denver, president; F. C. Chamberlain, Colorado Springs, first vice-president; J. H. Parsons, Boulder, second vice-president; A. L. Whitney, Denver, recording secretary; A. H. Sawins, Denver, corresponding secretary; William Smedley, Denver, treasurer. The following delegates were elected to attend the American Dental Association, at Asbury Park, N. J.: J. M. Norman, Sarah May Townsend, C. F. Dodge, J. N. Chiply, J. H. Parsons, J. S. Donaldson, M. A. Bartelson, William Smedley, P. T. Smith, H. A. Fynn, R. B. Weiser. The association adjourned to meet in Denver in June, 1896.

SARAH MAY TOWNSEND,
1429 S. 13th st., Denver, Col.

## PENNSYLVANIA STATE DENTAL SOCIETY.

AT the twenty-seventh annual meeting of the Pennsylvania State Dental Society, held at Eagles Mere, July 9, 10, 11, 1895, the following officers were elected to serve for the ensuing year: Edward C. Kirk, Philadelphia, president; H. N. Young, Wilkes-Barre, first vice-president; Robert Huey, Philadelphia, second vice-president; C. V. Kratzer, Reading, recording secretary; V. S. Jones, Bethlehem, corresponding secretary; G. W. Klump, Williamsport, treasurer.

State Board of Dental Examiners: W. E. Magill, Erie, president; J. C. Green, West Chester, secretary; Louis Jack, 1533 Locust St., Philadelphia; L. Ashley Faught, 1415 Walnut St., Philadelphia; C. S. Beck, Wilkes-Barre; G. W. Klump, Williamsport.

Board of Censors: W. H. Fundenberg, W. F. Litch, H. S. Seip, George D. B. Darby, H. B. McFadden.

C. V. KRATZER, *Cor. Secretary*,
Reading, Pa.

## NORTH DAKOTA DENTAL SOCIETY.

THE thirteenth annual meeting of the North Dakota Dental Society was held at Fargo, May 15 to 17, 1895. The following officers were elected: Dr. H. L. Starling, Fargo, president; Dr. M. M. Lockerby, Grand Forks, vice-president; Dr. L. E. Hunter, Grand Forks, treasurer; Dr. F. E. Ball, Fargo, secretary; Drs. F. E. Ball, E. M. Pierce, C. B. Davenport, executive committee.

FRED. E. BALL, *Secretary.*

## GEORGIA STATE DENTAL SOCIETY.

THE twenty-seventh annual meeting of the Georgia State Dental Society was held at Indian Spring, Ga., June 11 to 14, 1895. The following officers were elected for the ensuing year: H. I. Colding, Savannah, president; J. A. Chappell, Atlanta, first vice-president; H. D. Wilson, Bainbridge, second vice-president; H. A. Lowrance, Athens, treasurer; S. H. McKee, Americus, recording secretary; O. H. McDonald, Atlanta, corresponding secretary. The next meeting will be held at the same place on the second Tuesday in June, 1896.

O. H. MCDONALD, *Cor. Secretary.*

# DENTAL COLLEGE COMMENCEMENTS.

## BOSTON DENTAL COLLEGE.

THE twenty-eighth annual commencement exercises of the Boston Dental College were held in Berkeley Temple, Boston, Mass., on Wednesday, June 19, 1895.

The annual address was delivered by Prof. George A. Bates, D.D.S.

The number of matriculates for the session was one hundred and seventy-two.

The degree of D.D.S was conferred on the following graduates by I. J. Wetherbee, D.D.S., president of the college:

| NAME. | STATE OR COUNTRY. |
|---|---|
| John F Ager | Massachusetts. |
| Arthur D. Allard | Massachusetts. |
| Walter I. Boynton | Massachusetts. |
| C. M. Carpenter | Massachusetts. |
| William M. Flynn | Massachusetts. |
| Helen M. Henry | Massachusetts. |
| Arthur Horsfall | New Brunswick. |
| Ernest Hosmer | Massachusetts. |
| Roscoe H. Hull | Massachusetts. |
| Walter M. Kelty | Massachusetts. |
| John W. Kenney | Massachusetts. |
| John W. Keyes | Massachusetts. |
| Charles B. Little | New Brunswick. |
| Carrie G. Locke | New Hampshire. |
| Guy B. Manzer | New Brunswick. |
| George H. Martin | New Hampshire. |
| John A. D. Mills | Massachusetts. |
| James T. Moriarty | Massachusetts. |
| James E. Nealis. | New Brunswick. |
| Albert W. Noll | Massachusetts. |
| Daniel B. Nye | Massachusetts. |
| John W. Pomfret | Massachusetts. |
| Percy M. Porter | Nova Scotia. |
| James F Potter | Massachusetts. |
| J. P. Reardon | Massachusetts. |
| John L. Reilly | Massachusetts. |
| William T. Reilly | Massachusetts. |
| F. X. M. P. Renaud | Massachusetts. |
| Walter E. Rowe | Maine. |
| William A. Rowe | Maine. |
| George A. Sleeper | Maine. |
| Westford M. Taylor | Massachusetts. |
| George O. Tessier | New Hampshire. |
| Edmond E. Vadnais | Massachusetts. |
| Charles E Walker | Massachusetts. |
| Richard A. Walsh | Massachusetts. |
| Lewis L. Warren | Massachusetts. |
| Oscar E. Wasgatt | Maine. |
| C. O. H. Webster | Nova Scotia. |
| R. L. Wentworth | Massachusetts. |
| Elmer L. White | Massachusetts. |
| Geo. W. Yale | Massachusetts. |

## DETROIT COLLEGE OF MEDICINE—DENTAL DEPARTMENT.

THE second annual commencement exercises of the Department of Dental Surgery of the Detroit College of Medicine were held at the Strassburg Academy, Detroit, Mich., on Monday evening, June 17, 1895.

Addresses were delivered by Professor T. A. McGraw, M.D., J. Ward House, D.D.S., Professor George L. Field, D.D.S., and Professor J. Taft, D.D.S.

The number of matriculates for the session was eighty-one.

The degree of D.D.S. was conferred on the following graduates by Hon. Sidney D. Miller, president of the college:

| STATE. | STATE OR COUNTRY. | NAME. | STATE OR COUNTRY. |
|---|---|---|---|
| H. R. Barclay | Ontario. | L. C. Moore | Michigan. |
| A. D. Buchanan | Ontario. | E. McDonald | Ontario. |
| T. J. Collins | Ontario. | J. W. McQueen | Ontario. |
| W. E. Cowen | Ontario. | H. Nesbit | Ontario. |
| J H. Dunn | Michigan. | S. C. Smith | Michigan. |
| M. A. Gardner | Michigan. | L. N. Wigle | Ontario. |
| W. G. Heasley | Michigan. | G. A. Wilson | Ontario. |
| J. F. Mackenzie | Ontario. | C. P. Wood | Michigan. |
| A. J. Monagin | Michigan. | F. W. Young | Michigan. |

## UNIVERSITY OF MINNESOTA—DENTAL DEPARTMENT.

THE annual commencement exercises of the Dental Department of the University of Minnesota were held, in connection with those of the law, medical, and other departments of the university, at the Exposition Building, Minneapolis, Minn., June 6, 1895.

The salutatory address was delivered by Clarence Benjamin Miller, and the valedictory by Julius J. Boraas.

The number of matriculates for the session was seventy-three.

The degree of D.M.D. was conferred on the following graduates by Cyrus Northrup, LL.D., president of the university:

| NAME. | STATE. | NAME. | STATE. |
|---|---|---|---|
| Henry C. Babcock | Minnesota. | Frank S. Robinson | Minnesota. |
| Frederick E. Cobb | Minnesota. | Arthur J. Sauer | Minnesota. |
| William A. Demo | Minnesota. | Erwin L. Sinclair | Minnesota. |
| Herbert B. Hurd | Minnesota. | George S. Todd | Wisconsin. |
| Frank H. Kyle | Minnesota. | Frank J. Wagner | Minnesota. |
| Mark O. Nelson | Minnesota. | Nathan L. Watson | Minnesota. |

## AMERICAN COLLEGE OF DENTAL SURGERY.

THE ninth annual commencement exercises of the American College of Dental Surgery were held at the Grand Opera House, Chicago, Ill., on Thursday, April 4, 1895, at 3.20 P.M.

The faculty address was delivered by Professor T. B. Wiggin, M.D., and the valedictory address by Dr. A. A. Clinkenbeard, D.D.S.

The number of matriculates for the session was three hundred and fourteen.

The degree of D.D.S. was conferred on the following graduates by Professor B. J. Cigrand, B.S., D.D.S., president of the board of directors:

| NAME. | STATE OR COUNTRY. |
|---|---|
| Florence R. Atkinson | Illinois. |
| Michael L. Aren | Illinois. |
| John Bradbury | Illinois. |
| Harry G. Burke | New York. |
| Frank W. Booth | Iowa. |
| Charles Norman | Iowa. |
| Robert B. Bogle, M.D. | Tennessee. |
| John B. Buehner | Illinois. |
| Frederick P. Bushspies | Illinois. |
| Frank Bisewski | Illinois. |
| Francis N. Brown | Illinois. |
| A. A. Clinkenbeard | Illinois. |
| Louis P. Coleman | Iowa. |
| George B. Crissman | Illinois |
| Arthur Enders | Michigan. |
| Frank T. Edwards | N. Dakota. |
| Augustine A. Flick | Pennsylvania. |
| Charles L. Good | Minnesota. |
| Jasper E. Green | Iowa. |
| Ira C. Gamern | Illinois. |
| Frank E. Gunther | Illinois. |
| William M. Griffith | Illinois. |
| William G. Hay | Wisconsin. |
| Harry G. Hitchcock | Wisconsin. |
| Henry D. Haffa | Iowa. |
| Hans M. Heggland | Illinois. |
| John H. Hartinger | Indiana. |
| Peter Hall | Canada. |
| Walter C. Hunt | Washington. |
| Clinton L. Hopkins | Texas. |
| Edson B. Jacobs | Ohio. |
| Oscar A. Johnson | Illinois. |
| Edward A. Kelly | Illinois. |
| Edward F. Kenyon | Illinois. |
| William Knedendorf | Illinois. |
| Emil Kark | Wisconsin. |
| Maurice Kraus, M.D. | Austria. |
| Samuel Lutz | Illinois. |
| William H. Lind | Wisconsin. |
| Chauncey C. Landon | Indiana. |
| John M. Little | Pennsylvania. |
| Leroy Lewis, B Sc. | Oregon. |
| Martin L. Menges | Indiana. |
| James W. Murray | Iowa. |
| William G. McDavitt | Illinois. |
| Chas. F. P. O'Connor | Illinois. |
| Waldo A. Overholser | Illinois. |
| Charles B. Payton | Iowa. |
| Gideon A. Price | Illinois. |
| James S. Reed | Nebraska. |
| R. F. Rowdybush | Illinois. |
| Meredith Rice | Illinois. |
| Elmer B. Roberts | Iowa. |
| James L. Russell | Iowa. |
| Frederick C. Rieck | Pennsylvania. |
| Theo. G. Scholz | Illinois. |
| Nathan W. Smith | Ohio. |
| Harry P. Stewart | Ohio. |
| Nelson I. Sims | England. |
| Frank H. Skinner | Illinois. |
| Andrew C. Thompson | Illinois. |
| Frank R. Timmermann | Illinois. |
| Albert P. Voorhies | Louisiana. |
| Casimir Wolpers | Ohio. |
| Isaac Wiener | Mississippi. |
| George R. White | Illinois. |

# DENTAL SOCIETY ANNOUNCEMENTS.

## AMERICAN DENTAL ASSOCIATION.

THE thirty-fifth annual session of the American Dental Association will be held at Asbury Park, N. J., commencing Tuesday, August 6, 1895.

GEO. H. CUSHING, *Recording Secretary.*

*Railroad Rates.*—A rate of *a fare and one-third for the round trip*, upon the "certificate plan," has been secured. In order to get this reduction full fare must be paid in going to the meeting, a *receipt* being obtained from the ticket agent at the *starting point.* If traveling over more than one line, secure a certificate over each line, or have the ticket agent at the starting point name in the receipt the different roads over which the ticket is good. This receipt (certificate) must be countersigned by the secretary of the association, and entitles the holder to return for one-third fare. Arrangements have been made to have the joint agent of the railroads present at Asbury Park on Wednesday, August 7, and it is desirable that all who intend to attend the meeting shall be in attendance, so that their railroad certificates can be passed upon at that time. No rates have been granted over the lines comprised in the Western Passenger Association. Members residing west of Chicago should secure the best rates to the point where they enter the territory in which the reduced rate prevails.

J. N. CROUSE,
*Chairman of the Executive Committee.*

# SOUTHERN DENTAL ASSOCIATION.

FOLLOWING is a list of the officers and committees of the Southern Dental Association, furnished by Dr. E. P. Beadles, corresponding secretary of the association.

*Officers of the Association.*—H. E. Beach, Clarksville, Tenn., president; J. S. Thompson, Atlanta, Ga., first vice-president; L. P. Dotterer, Charleston, S. C., second vice-president; R. D. Seals, Fort Smith, Ark., third vice-president; H. A. Lowrance, Athens, Ga., treasurer; E. P. Beadles, Danville, Va., corresponding secretary; S. W. Foster, Atlanta, Ga., recording secretary.

*Committee on Arrangements.*—Frank Holland, Atlanta, Ga., chairman; C. T. Brockett, Atlanta, Ga.; J. A. Thornton, Atlanta, Ga.

*Committee on Operative Dentistry.*—W. J. Barton, Paris, Texas, chairman; W. T. Arrington, Memphis, Tenn.; E. Wagner, Montgomery, Ala.; R. A. Bullington, Memphis, Tenn.; J. Rollo Knapp, New Orleans, La.; U. D. Billmyer, Chattanooga, Tenn.; William Crenshaw, Atlanta, Ga.

*Committee on Prosthetic Dentistry.*—R. R. Freeman, Nashville, Tenn., chairman; R. K. Luckie, Holly Springs, Miss.; C. L. Alexander, Charlotte, N. C.; J. R. Dodge, Douglass, Ga.; George Evans, New York, N. Y.; W. H. Marshall, Oxford, Miss.; W. G. Browne, Atlanta, Ga.

*Committee on Dental Education.*—Gordon White, Nashville, Tenn., chairman; M. F. Finley, Washington, D. C.; W. J. Boozer, Columbia, S. C.; D. N. Rust, Alexandria, Va.; W. E. Walker, Bay St. Louis, Miss.; G. M. Rousseau, Montgomery, Ala.; A. W. Harlan, Chicago, Ill.

*Committee on Hygiene.*—J. H. Durham, Wilmington, N. C., chairman; B. D. Brabson, Knoxville, Tenn.; L. M. Cowardin, Richmond, Va.; W. J. Morrison, Nashville, Tenn.; T. M. Hunter, Fayetteville, N. C.; J. N. Jones, Jacksonville, Fla.; C. S. Stockton, Newark, N. J.

*Committee on Pathology and Therapeutics.*—T. H. Parramore, Hampton, Va., chairman; I. N. Carr, Tarboro, N. C.; G. J. Friedrichs, New Orleans, La.; E. G. Quattlebaum, Columbia, S. C.; T. P. Hinman, Atlanta, Ga.; J. C. Wilkerson, Selma, Ala.; J. H. Marshall, Chicago, Ill.

*Committee on Histology and Microscopy.*—A. G. Friedrichs, New Orleans, La., chairman; J. Taft, Cincinnati, Ohio; C. V. Rosser, Atlanta, Ga.; James Chace, Ocala, Fla.; E. S. Chisholm, St. Louis, Mo.; J. H. Harris, Baltimore, Md.; W. C. Klatte, Charleston, S. C.

*Committee on Chemistry.*—L. D. Carpenter, Atlanta, Ga., chairman; A. A. Dillehay, Meridian, Miss.; S. P. Sharp, Knoxville, Tenn.; R. C. Young, Anniston, Ala.; L. Augspath, Little Rock, Ark.; Morgan Adams, Sardis, Miss.; D. R. Stubblefield, Nashville, Tenn.

*Committee on Literature and Voluntary Essays.*—M. C. Marshall, Little Rock, Ark., chairman; W. W. H. Thackston, Farmville, Va.; G. F. S. Wright, Georgetown, S. C.; Francis Peabody, Louisville, Ky.; H. W. Morgan, Nashville, Tenn.; E. L. Hunter, Enfield, N. C.; W. H. Cook, Denton, Texas.

*Committee on Publication.*—S. W. Foster, Atlanta, Ga., chairman, *ex officio;* L. G. Noel, Nashville, Tenn.; B. H. Catching, Atlanta, Ga.

*Committee on Appliances and Improvements.*—H. J. McKellops, St. Louis, Mo., chairman; George Eubank, Birmingham, Ala.; G. S. Staples, Sherman, Texas; F. H. McAnnally, Jasper, Ala.; W. T. Martin, Yazoo City, Miss.; C. Still, New York, N. Y.; I. N. Wills, Savannah, Ga.

*Master of Clinics and Chairman of Clinic Committee.*—S. B. Cook, Chattanooga, Tenn.

## NORTHERN IOWA DENTAL SOCIETY.

THE annual meeting of the Northern Iowa Dental Society will be held at Clear Lake, September 3, 4, and 5, 1895. A good program has been prepared, and a very interesting and instructive meeting is expected. Thursday afternoon will be devoted to social enjoyment,—a tour of the lake, regatta, etc.

For further information or copies of program, address Dr. J. J. Grout, Rock Rapids, Ia., or Dr. G. H. Belding, Calmar, Ia. All dentists in Iowa and adjoining states are cordially invited.

WM. H. STEELE, *Chairman Executive Committee.*

# EDITORIAL.

## NOSTRUMS AND THE CODE OF ETHICS.

IT has been a matter for much adverse and justly-merited criticism that reputable medical journals, and dental journals as well, should lend their advertising pages to the uses of the nostrum vender for the sake of the financial support thereby gained. The blatant display of extravagant and impossible claims set forth by the proprietors of these abominations in the daily press is an evil which, like Pope's "monster of hideous mien," has been so long endured that the public, if they have not already done so, at least seem willing to embrace. So great is the financial support derived from nostrum advertisements by the public press that this fact alone constitutes one, if not the greatest, of the obstacles in the way of effective legislation for controlling the nefarious traffic. Nobody attempts to deny the right of any state under its police powers to enact laws prohibiting the sale of medicines of unknown composition. It is a right and a function within the power of the state as clearly and unquestionably as is any other legislative action guarding the public health. But the financial and commercial interests involved are of such magnitude, and affect directly or indirectly so many industries, that any attempt at inhibiting the activities of the goose which lays these golden eggs is met on all sides by the most determined, and thus far effectual, opposition. The pharmacy laws of the several states, while they are often stringent and explicit in their provisions governing the sale and dispensing of poisonous drugs, are uniformly silent with respect to nostrums. To a similar extent medical and dental legislation avoids all attempts at regulating the traffic, and any one may purchase and use to the limit of his desires any nostrum in any quantity, without let or hindrance, so far as the law is concerned.

The ethical side of the question is definitely met and disposed of, so far as medical and dental practitioners are concerned, by the code of ethics of the American Medical Association, which declares that to use or in any way to promote the use of nostrums is reprehensible. Notwithstanding this clearly expressed statement of the governing medical body, the use of nostrums has been promoted and aided in the most direct and substantial manner by the highest class medical journals, whose advertising pages teem with the preposterous claims and laudatory testimonials of this class of preparations. It seems to be accepted as entirely consistent with the dignity and ethical professions of a high-class journal, while upholding in its editorial and reading pages the spirit of the code which condemns the use of, and promotion of the use of, secret nostrums as reprehensible, to prostitute its advertising pages in furtherance of the very evil which possibly in the same issue its reading pages may condemn. No argument is needed to demonstrate the illogical and inconsistent character of such a course. The character of a journal is determined by the contents of its advertising pages as well as by its literary features, and no disclaimer or excuse can relieve its editor or publishers from their share of moral responsibility for the entire output of matter between its covers.

While this view applies to all journalism, its application is obvious and direct to the professional and technical publications of a body of men who profess allegiance to a code of ethics which specifically condemns the course in question.

The evil has long been recognized, but it is only recently that a determined effort has been made to eradicate it. In 1892 resolutions were unanimously adopted at the meeting of the American Medical Association, instructing the trustees of its official organ to in future respect this prohibition of the code respecting nostrums in the discharge of their trust. Thereupon the trustees appear to have evaded this command by adopting as their governing policy the rule, "That an advertisement of a proprietary medicine shall be accepted at the discretion of the committee when the proprietors thereof shall furnish the complete formula." The advertisement of nostrums in the *Journal of the American Medical Association*, however, continued without publication of their formulæ. This led to further protest from the Philadelphia County Medical Society, which at a meeting held May 23, 1894, instructed its delegates to co-operate with a similar delegation from the Pennsylvania State Medical Society to bring before the Judicial Council of the American Medical Association, at its San Francisco meeting, these questions relating to the conduct of the association *Journal*. After much discussion of the subject of nostrum advertising, wherein the trustees of the *Journal* defended their course on the ground that the money from these advertisements was needed to publish such a journal as they thought creditable to the association, the attitude of the trustees in this matter was reversed and the following was made a part of their report :

> "During the year no advertisements of secret remedies have been accepted that were not accompanied by a formula ; but to still further comply with what appears to be the desire of a large number of those interested in the highest success of the *Journal* the editor, with the termination of the present contracts, has been instructed *to accept no advertisements of medicinal preparations the proprietors of which do not give a formula containing the official or chemic name and quantity of each composing ingredient, to be inserted as a part of the advertisement.*"

Whereupon the Medical Society of the State of Pennsylvania, at its meeting in Chambersburg, Pa., May, 1895, passed the following resolutions :

*Resolved*, That the Medical Society of the State of Pennsylvania congratulates the American Medical Association upon the decision of the trustees to exclude unethical advertisements from the Journal of the Association ;

*Resolved*, That a committee of three be appointed to communicate with the editors and publishers of medical journals in the United States, calling their attention to this action of the American Medical Association, and requesting them to accede to the wishes of the profession by adopting a similar rule.

In pursuance of this resolution the committee have prepared a circular, a copy of which is to be sent to the editor and publisher of each medical journal in the United States, requesting their co-operation, and asking them to adopt a similar rule with respect to the advertising of nostrums in their pages.

This effort upon the part of a few medical practitioners whose ideas of ethics are not warped by questions of finance is one which should receive the hearty support of every practitioner of medicine and of dentistry who has the best interests of his profession at heart. The question of the use of nostrums is obtruding itself upon dental practice with increasing persistence daily. Our associations, many of them, have passed resolutions condemning their use as unprofessional, and as tending to promote quackery and unscientific therapeutics. This is all well enough as far as it may tend to create a sentiment of opposition to such use. There is, however, a large measure of personal responsibility which belongs to practitioners as individuals, and which cannot be avoided or shirked. Let each man feel that it is a question not only of professional interest but of personal honor, affecting his duty to his patients, and the business of nostrum manufacture will soon become too unprofitable to continue.

## ADDED PAGES.

SIXTEEN extra pages of reading matter have been added to this month's issue, notwithstanding which we are compelled to omit much valuable matter already in type, which will appear in our next number.

# BIBLIOGRAPHICAL.

General Pathology and Surgery for Dentists. By Edmund W. Roughton, B.S., M.D. (London), F.R.C.S. (England), etc. With numerous illustrations. London: J. P. Segg & Co.; Philadelphia: The S. S. White Dental Manufacturing Co.

Into a duodecimo volume of one hundred and thirty-four pages the author has condensed some elements of general surgical pathology. The title "General Pathology and Surgery for Dentists," is rather misleading when the scope of the work is considered. As we view the matter, it is quite as essential for the dental practitioner to possess an exhaustive knowledge of the principles of general pathology as it is for the follower of any other special aspect of the healing art. In the main, the work has been well done. Due allowance must be made in all condensations, as it is by no means an easy task to sift from a general subject its essentials and give them the coherence they should possess. We recommend for the careful reading of dentists (to whom the work cannot fail to be useful) an excellent and comprehensive chapter on the organisms of the mouth. The chapter on inflammation would bear extension, as the dental practitioner is intimately concerned with the minute phenomena of this process.

The local treatment of erysipelas would be regarded as insufficient in this country. Pilocarpine is not mentioned in the constitutional medication,—probably an oversight. In the treatment of septicemia the use of quinin is not emphasized, and the necessity for the removal of local causes of the poisoning is not mentioned.

Most of the descriptions are clear,—so clear as to make the book one of positive value in its field. The cuts are crude but illustrative.

No mention is made of mercuric iodid in the treatment of secondary syphilis. The clear descriptions of the oral manifestations of syphilis should be read by every dentist.

The chapters on tumors are good, but no mention is made of the metamorphosis of tumors.

The work is one which every dental practitioner will find a most useful addition to his library. H. B.

Dental Microscopy. By Hopewell Smith, L.R.C.P. London, M.R.C.S. England, L.D.S. England; late assistant demonstrator of histology at Charing Cross Hospital Medical School. With eight lithograph plates from original drawings. Philadelphia: The S. S. White Dental Manufacturing Co.; London: The Dental Manufacturing Co., Limited, 1895. Price, cloth, $2.00.

This is a volume which has long been needed by all interested in the field of dental histology. It presents in a concise manner the chief methods of making microscopical preparations, and enables the student, in connection with the illustrations, to recognize the most important features of the dental tissues. The notes are full and clear, so that the average student may follow the line of projected work without difficulty. It is not intended to be an exhaustive work, but as a guide to the student, for which purpose it is admirably adapted. The lack of a suitable work in English which describes in clear terms the technique of microscopical investigation as applied to the dental tissues, has been an obstacle to the more general acquisition of this department of knowledge upon the part of American dental students. The present work should do much to overcome that difficulty, and stimulate research and study in that most important department of dental science.

# OBITUARY.

## DR. J. J. R. PATRICK.

DIED, at his residence in Belleville, Ill., April 10, 1895, JOHN JOSEPH RAVENSCROFT PATRICK, D.D S., in the sixty-eighth year of his age.

The announcement of the death of Dr. Patrick came with a shock to those of his friends who, although aware of his long and serious illness, had come to hope, as he himself believed, in his final recovery of health and restoration to useful work in the paths of science. In a letter to the writer, a few weeks before the end, he expressed his gratification at feeling much better, and hoped soon to be able to resume his literary work, to which he expected to devote his attention almost exclusively, having in contemplation the preparation of several volumes embodying the results of his lifetime of study.

John Joseph Ravenscroft Patrick was born in Liverpool, England, February 6, 1828. When he was fourteen years of age, his parents, with their family, emigrated to this country, settling first in New Orleans, removing afterward to Louisville, Ky., and again to Keokuk, Ia., where the father, Dr. Hugh Patrick, a physician, died in 1847. Young Patrick thought at one time of following in the footsteps of his father, and to this end took a course of lectures in McDowell Medical College; but having a decidedly mechanical turn of mind, and believing that his mechanical ability, which had been trained and developed by an apprenticeship of some years to a jeweler, would be of greater service in the practice of dentistry, he took up that study in the office of his brother, and commenced practice in St. Louis about 1850.

In 1853, Dr. Patrick removed to Belleville, Ill., where he prosecuted the practice of dentistry till, in the fall of 1862, he enlisted in the One Hundred and Thirtieth Illinois Infantry, and served with his regiment until its consolidation in January, 1865, with the Seventy-seventh, having in the mean time been promoted to the captaincy of Company G. Then, his health having failed, he resigned from the army, and resumed the practice of dentistry, continuing until his fatal illness. The cause of death was cirrhosis of the liver and chronic gastric catarrh. Dr. Patrick was twice married. In 1853 at Lebanon, Ill., to

Miss Jane Johnston, who died some five years since; and on March 15, 1895, to Miss Anna Rischar, who had been his secretary, and who survives him. He left no children.

John J. R. Patrick was one of the notable figures in the history of dentistry of his day and generation. While working earnestly and faithfully in the practical field of his chosen profession, he early felt the need of a wider basis of real understanding of the problems which underlie the practice of dentistry, and he toiled incessantly to contribute his share to their solution. Perhaps to his clear exposition of the facts, more than to any other one man's efforts, is due the final dispersion of the myth that dental caries is a disease of modern origin. He showed, conclusively, by painstaking examination of thousands of pre-historic skulls, that the dentures of the ancient races were afflicted by the same disorders as are those of the present inhabitants of the world. So conspicuously well had his work in this direction been done, that the American Dental Association made him the curator of the great investigation which it set on foot some years since of all the available pre-historic crania in America. The work was carried out under his direction, the final report, embracing the detailed tabulation of the dental characteristics of many thousands of dentures, having been printed in the Transactions of the Association for 1895.

On the practical side of dentistry Dr. Patrick also did notable work, as attested by a number of useful inventions with which he enlarged the armamentarium of the dentist. Among these may be mentioned his well-known devices for the regulation of teeth, artificial crowns and devices for making them, etc.

Besides his labors in behalf of his chosen profession, Dr. Patrick's thirst for knowledge led him into other paths, and his work in the departments of archeology and ethnology made him known to scientific men the world over. He surveyed the great Cahokia mounds in Illinois, and made models of them, which are now in the collections of the Smithsonian Institution and other similar institutions in Europe. He made several large archeological collections, the most important of which, together with his original survey drafts of the Cahokia mounds, is now in the possession of the Missouri Historical Society, and known as the Patrick collection. Dr. Patrick was also for many years the correspondent on matters relating to ethnology and archeology of the Smithsonian Institution and various similar bodies in Europe, for his section.

In whatever he undertook to do, Dr. Patrick was a tireless worker. No detail was too deeply hidden to be searched out, or so trivial as to be overlooked, if it had a possible bearing on the subject under investigation. As is common among men of great ability, he was of modest demeanor, but of positive convictions. He never made up his mind until he had investigated and *knew*; but when he had reached a conclusion he was ready and able to defend it against all comers, or to take the aggressive if that course would better spread the knowledge of truth. He was a ready speaker, a skilled controversialist. He has published a number of monographs and contributions to dental and other periodicals, and has, of late years especially, borne a prominent part in the principal dental gatherings of the country, where his intimate and positive knowledge of whatever subject he discussed gave to what he had to say a peculiar value and interest.

His genial disposition, unassuming ways, and his invincible courage gained him many friends, one of whom, referring to his modesty, in a recent letter doubts if his real worth will ever be known. He will be missed at the gatherings where his presence has so long been an inspiration to true work, as well as in the social circle which he adorned.

Dr. Patrick was a member, honorary or active, of many societies, dental and other. Among them may be named the Illinois State Dental Society, of which he had been president ; Iowa State Dental Society ; Odontological Society of New York ; St. Louis Dental Society ; First District Dental Society of the State of New York ; Mississippi Valley Association of Dental Surgeons ; American Dental Association ; St. Clair Medical Association of Illinois ; American Ethnological Society of New York ; and Anthropological Society of Washington, D. C. He was also a member of the Grand Army of the Republic, and of the Military Order of the Loyal Legion of the United States.

F. L. H.

## DR. A. C. HAWES.

DIED, at Noroton Heights, Fairfield county, Conn., April 7, 1895, of general debility and heart-failure, ARNOLD C. HAWES, M.D.S., in the eighty-second year of his age.

The subject of this sketch came of Revolutionary stock, his grandfather having taken part in the battle of Lexington. Dr. Hawes was born at Wrentham, Mass., November 5, 1813. He studied dentistry, and entered upon its practice at Pawtucket, R. I., in 1838. In 1840 he removed to Providence, and became the senior partner of the firm of Hawes Brothers & Seabury, which carried on a large dental practice there for eighteen years. He went to New York city in 1858, and soon became one of the leading dentists of that metropolis, where he was in practice for over twenty-three years, until failing eyesight compelled the relinquishment of his profession. For many years his home has been at Noroton Heights (Darien), Conn. After his enforced retirement, however, Dr Hawes's mind was active in many ways, and he created and patented several useful inventions, among the most important of which was the duplex horseshoe, designed to prevent the horse from slipping on the ice. It came into extensive use, and from it the doctor realized a handsome sum.

Dr. Hawes received the degree of M.D.S. from the New York State Dental Society. He was at one time a member of the American Dental Association ; of the Dental Society of the State of New York, of which he was treasurer for a term of years ; of the First District Dental Society of the State of New York, and at one time its president ; and a life member of the New England Society. He was also a member of the Historical Society of the City of New York, and of the Union League, and belonged to the fraternal orders of Masons and Knights Templar.

In 1853 Dr. Hawes was married in Brooklyn to Miss Eliza C. Wardlow, of Massachusetts, who survives him. They had two sons,—Frederick, who died in 1882, and Frank A., who died in 1891 Being of a genial disposition, and actuated by high motives, Dr. Hawes was greatly esteemed by his patients, and was accorded a prominent position by the profession. He was possessed of an uncommon measure of native skill and ingenuity in mechanics, and this, coupled with fine ability as an operator, won for him his large degree of success. It may be mentioned that during the gold excitement of 1849 Dr. Hawes made an overland journey to California, but not realizing his expectations, he returned after an absence of about a year.

Following we append the "report of the committee of the New York Odontological Society appointed to draft resolutions respecting the death of Dr. Arnold C. Hawes, dated May 27, 1895," and which was adopted by the society:

Your committee do respectfully report as follows:

On the seventh day of April last, Dr. Arnold C. Hawes, one of the earliest and most esteemed members of this society, entered into his final rest.

Soon after the formation of the society he was elected an active member, and so continued until he retired from practice and took up his residence at his country seat in Connecticut. He then tendered his resignation and was made an honorary member.

Dr. Hawes was one of the founders of the First District Dental Society, its first vice-president, and second president. He was one of the original members of the Dental Society of the State of New York, and for many years its treasurer. He was among the first members of the American Dental Association, and for a time served as treasurer of that organization.

Dr. Hawes was one of the most prominent and best respected members of our specialty; a man of sterling integrity, with generous impulses and candid manners. He was much interested in the work of our professional associations, and especially so in this his favored society. He was also an occasional contributor of articles for our dental journals.

Most of the gentlemen present will remember his ever genial, smiling face, and the warm grasp of his friendly hand He was a model of good nature, winning the respect and love of all who knew him. You will perhaps also remember that for many months Dr. Hawes was almost totally blind, yet he bore his misfortune with a remarkable degree of cheerfulness; and when by a surgical operation his sight was partly restored, his joy and gratitude seemed unbounded.

In view of the departure of our late friend and fellow-member, it is fitting that we record our high appreciation of his excellent character as a gentleman and a professional worker; therefore be it

*Resolved*, That while we mourn the loss of one who for so long a time was our intimate associate, and who by his cheerful spirit and kindly disposition endeared himself to his friends and fellow-members, we are devoutly thankful that it was our privilege to enjoy his genial companionship and to have been classed among his friends; and in our affectionate remembrance comes also the cheering thought that he led a good and useful life, and earned an honorable record.

[Signed by Charles E. Francis, C. A. Woodward, and Albert H. Brockway, committee.]

## DR. ELISHA G. TUCKER.

DIED, in Boston, Mass., May 18, 1895, of influenza, ELISHA G. TUCKER, M.D., in the eighty-seventh year of his age.

Dr. Tucker was born at Winchendon, Mass., August 18, 1808. He commenced the study of medicine at Geneva, Oneida Co., N. Y., in 1834. He received his degree of M.D. at the Berkshire Medical College, Pittsfield, Mass., in 1837, and immediately commenced dental practice at that place and at Lenox. It should be explained that the medical degree was at that time the only one available as a preliminary for those desiring to thoroughly equip themselves for the intelligent practice of dentistry.

In 1838, Dr. Tucker removed to New York city, and succeeded to the practice of Dr. Horace Kimball, in Park Place. Soon after he formed a copartnership with the late Joseph H. Foster, M.D., in that city, and this connection continued with marked success until 1841, when Dr. Tucker went to

Boston to become a partner of his brother, the late Joshua Tucker, M D. This successful relation continued for ten years, after which he pursued his profession alone up to 1872, when his son, Dr. W. L. Tucker, became associated with him for some time.

Dr. Tucker was a member of the American Society of Dental Surgeons in 1840; of the Massachusetts Medical Society in 1843; of the Medical Benevolent Society in 1850, and was vice-president of the American Dental Convention in 1857. He was also one of the founders of the American Academy of Dental Science, and president of the same for two years.

On the 17th of January, 1843, Dr. Tucker was married to Miss Elizabeth M. Harris, who survives him, with one son, Winslow Lewis Tucker, A M., D.M.D.

## DR. THOMAS H. MUSGROVE.

Died, at Philadelphia, Pa., April 1, 1895, of typhoid pneumonia, Thomas H. Musgrove, D.D.S., in the sixty-third year of his age.

Dr. Musgrove was born in Newark, New Castle Co., Del., September 7, 1832. He received his early education at the academy in his native town. When about eighteen or nineteen years of age he began the study of dentistry with Drs. Haines and McKowan, of Newark, Del. After completing his pupilage he located in Tuscaloosa, Ala., where he remained but one year, in consequence of ill health. Returning North, he located in Elkton, Md., where he pursued his professional work until the breaking out of the civil war in 1861. Dr. Musgrove cast his lot with the Southern Confederacy, and in company with two companions succeeded in reaching Richmond, when he joined the Army of Northern Virginia. He remained in that service, experiencing many hardships, until the autumn of 1864, when, hearing of the serious illness of his aged father, he resolved to reach home at any risk. Obtaining a furlough to visit the far South, he turned his face northward instead, and after many weary days and nights of travel, much of the way on foot, he succeeded in reaching Washington and Baltimore. He was arrested in Baltimore on suspicion of being a rebel spy, was thrown into prison, and kept in close confinement until the spring of 1865, when through the influence of friends his case was presented in all of its details to President Lincoln. His pardon was signed, and Dr. Musgrove was liberated but a week before President Lincoln's assassination.

Dr. Musgrove was a brave soldier, and during his service in the Confederate ranks endured hardships which would break the spirit of men less courageous than he.

At the close of the war he again located in Elkton, Md., and continued in practice there until 1872, when he removed to Philadelphia and associated himself with the late Dr. Daniel Neall, with whom he remained for a period of four years. He then established himself in practice, and enjoyed the confidence and respect of all who sought his services, until the day of his death.

Dr. Musgrove graduated in dentistry from the Pennsylvania College of Dental Surgery, class of 1867. He was a retiring, modest man, a true friend, a devoted son to his widowed mother, a loving brother, and an honest man.

E. T. D.

## DR. WILLIAM E DUNN.

Died, in New York city, December 30, 1894, of Bright's disease and complications, Dr. William Edwin Dunn, in the seventy-second year of his age.

Dr. Dunn was born at Lyons, N. Y., May 18, 1823. He commenced the study of dentistry about 1853 with Drs. Morgan and Burrill, Cleveland, Ohio, and entered upon practice at Delaware, in the same state, in 1856; removed to Dayton in 1869; thence to Watertown, N. Y., in 1876, and to New York city in 1879, where he was in constant and successful practice at No. 331 Lexington avenue, up to within a few months of his death.

Dr. Dunn was twice married,—first, to Caroline S. Cady, in August, 1847; second, to Ella E. Plotner, December 22, 1887. His wife and a son and daughter survive him.

One who knew well his life-work writes of him: "Dr. Dunn, at the beginning of his practice, began to develop and perfect the porcelain plate, and, by the exercise of his indefatigable industry and zeal, he made improvements which have constituted it the perfect plate with which his name is usually connected. It was his life-work in his profession, and his pride. He was a genius in dentistry, a friend to the poor, and a Christian gentleman."

## DR. S. A. MAIN.

Died, at his residence in New York city, April 10, 1895, of diabetes and heart-failure, Stephen A. Main, D.D.S., in the seventy-seventh year of his age.

Dr. Main was born in Massachusetts, in 1818. He studied dentistry, and commenced its practice about 1843, and the main portion of his professional life was spent in New York city. He received the honorary degree of D.D.S. from the Baltimore College of Dental Surgery. He took a great interest in dental education, and was a member of the board of trustees of the New York College of Dentistry from 1867 until 1894, having been president of that body from 1869 until 1875, during which period he took an active part in opposing suits brought to revoke its charter. Specimens of his unique dental work are now exhibited at the college. He leaves a widow and one son.

## DR. DAVID P. WARD.

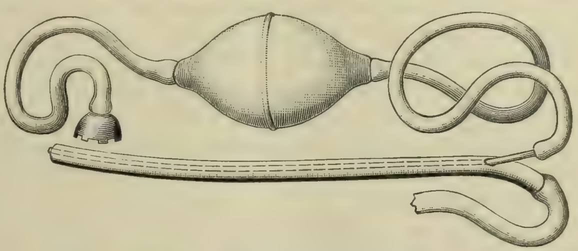
Died, at New Bedford, Mass., April 18, 1895, of intestinal tumor, Dr. David P. Ward, in the seventy-second year of his age.

Dr. Ward was born in Nantucket, Mass., in 1823. He entered upon his dental pupilage in 1854, in New Bedford, with Dr. E. G. Ward, and in 1858 entered upon practice for himself at Nantucket, subsequently removing to New Bedford, where he has long been known as a successful practitioner up to the time of his decease.

In 1845 Dr. Ward was married to Miss Mary J. Ackerman, in New York city, and she and two daughters survive him. Dr. Ward was universally esteemed for his intelligence and many fine qualities as a man, and his death is deeply regretted by all who knew him.

# HINTS, QUERIES, AND COMMENTS.

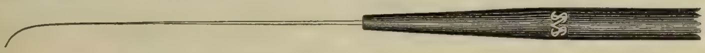
ABSCESS SYRINGE.—Apropos of the discussion in the May number of the DENTAL COSMOS on Dr. Allen's paper on diseases of the antrum, the difficulty in washing out the cavity led me, four years ago, to devise a form of syringe to enable it to be done thoroughly, easily, and painlessly, by either patient or operator. I use a nickeled tube about one-fourth of an inch in diameter, six inches long, and slightly curved, inside of which is another tube of the same length, but of one-fourth the carrying capacity, which leaves the larger one at its outer end, each terminating in a nipple for the attachment of rubber piping. If to the smaller tube be attached an ordinary family bulb-syringe and to the other a couple of feet of small rubber tubing leading to a basin, the patient cán put the suction-pipe of the bulb-syringe into a vessel containing an ample supply of whatever wash is used and gently wash out the antrum, the fluid passing up the small tube, circulating through the cavity, and flowing easily out of the larger into the vessel ready to receive it. By this device one is enabled to use a tube of nearly or quite the size of the original opening, assuring ample escape for the contents of the antrum, its attachment to flexible tubing allowing easy insertion, and doing away with the pain caused by the slight lateral movement caused by the act of working an ordinary syringe, the waste fluids escaping into a proper receptacle and not into the mouth, thus being far more available for purposes of examination and avoiding the stoppage of the exit of the fluid during the operation, as the pressure by the syringe on a cavity already full is very apt to cause intense pain, which, although temporary, is quite enough to cause the patient, if the operation be left to him, to be less punctual and thorough than is necessary for a speedy and permanent cure.—CHARLES RATHBUN, London, Eng.



USE OF NERVE-BROACHES IN PULP-CANALS.—I have found such satisfaction in the use of "Donaldson's nerve-broaches," particularly in the treatment of pulp-canals, that I wish to mention some uses which I have found extremely valuable, and hope they will prove so to others.

The hooked broaches can be used, *by bending the hook straight*, to probe and find very small canals, both when their presence is doubtful and when a canal-drill has left the true canal and started a false one.

As follows: By giving a slight curve to the broach at or near the point,—like this,—and by observingly moving the point up and down the walls of the canal, rotating it, the fine point will discover the orifice and indicate where to continue drilling.



If the broach is straightened and the point inserted in the true canal, the shank will show by touching in the pulp-chamber, or in the coronal cavity, where these parts must be cut away to allow the drill free access in following the canal, whatever new direction the axis of the canal may take.

The same can be done in superior and inferior molars First straighten the broach, then sharply bend it one-half to three-fourths inch from the point. The point now being recurved, as in the picture, can, by recurving several times (in different directions), be made to reach all sides of the canal and discover its orifice, the direction of its axis, and the parts of coronal cavity, of the vestibule (pulp-chamber in crown), and even the side of the canal, necessary to remove for free and direct access of drill.

Another use I wish to mention is,—by drawing these smooth broaches across a piece of beeswax they will hold a few filaments of absorbent cotton simply by twisting the broach between the fingers and against the cotton. In this way a canal can be tested for odors, moisture, and secretions, and even the diameter can in many cases be determined. It is also a convenient instrument, thus used, for washing and medicating canals, and for introducing thinly mixed cement (oxyphosphate) prior to filling when crowning roots, or for bathing them with any application desirable, or for cleansing and dressing the sulci of pyorrhea. The easy removal of cotton from the broach saves much time and inconvenience.

By placing a small square of rubber-dam (about one-tenth inch square) on a fine, straight broach, and passing the latter within a pulp-canal to the apex of the root, the point will catch upon the internal shoulder of the foramen, and the rubber gauge can be adjusted at the level of the most prominent coronal point or cusp. Withdrawing the broach, with care not to disturb the gauge, the length from gauge to point can be transferred to a piece of orange-stick by notching, and the stick marked with patient's name, tooth, etc. This standard measure can be preserved for use in adjusting the gauge on pulp-extractors, drills, dressing-broaches, and pluggers, when operating in that particular canal.

If the apex of a root should present under examination a bell-shaped or an eroded mouth (thereby abridging the depth to which the canal should be filled), the exact length of normal canal, from the coronal prominence to the least prominent part of brim of apex, can be ascertained by passing a hooked broach to the apex and rotating it till hooked upon the least prominent part of brim, and then adjusting the gauge as described above.

The use of a rubber gauge—on drills when opening and cleansing pulp-canals, and when making a shoulder near the apex to build the filling against; on broaches for sounding and dressing, particularly where contact without pressure is necessary; on pluggers, particularly when filling at the apex, and preferably during the entire filling of a pulp-canal; in ascertaining what length of apical portion of root is diseased enough to require excision; and in finding the exact length which can be given the dowel of an artificial crown—is obvious. As a guide it insures precision, and, if constantly used, gives positive evidence that the mechanical part of an operation is perfectly executed.

The hooked broach is also useful in exploring for defects in teeth or fillings.

Varnish will hold cotton on a smooth broach where medicines are to be applied in abscesses, sinuses, or pus-pockets. It can be scraped off, or dissolved off in alcohol very easily.

These uses of this broach occurred to me in 1881, and have been employed ever since with excellent results.—Benj H. Douglass, D.D S., Boston, Mass.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

**The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.**

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**Roughton** (Edmund W.) General surgery and pathology for dentists. 8°, 134 p., 26 pl. London & Philadelphia, 1895, J. P. Segg & Co. & S. S. White Dental Mfg. Co.

**Smith** (A. Hopewell.) Dental microscopy. London & Philadelphia, 1895, Dental Mfg. Co. & S. S. White Dental Mfg. Co.

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# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING JUNE, 1895.

*June 4.*—No. 540,258, to L. S. Keagle. Dental polishing-chuck.
" " No. 540,562, to Jacob Simonson. Dental saliva-siphon.
" *11.*—No. 540,832, to A P. Gould. Surgical and dental chair.
" " No. 540,844, to W. G. Stout. Tooth-brush.
" *18.*—No. 541,211, to George W. Nutz. Dental tool-holder.
" *25.*—No. 541,501, to William D. Porter. Apparatus for annealing gold.
" " No. 541,589, to A. W. Browne. Dental chair.
" " No. 541,694, to William R. Sine and F. H. Ward. Vulcanizer.
" " No. 541,727, to J. W. Dennis. Tooth-brush.

THE

# DENTAL COSMOS.

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## ORIGINAL COMMUNICATIONS.

# AN INVESTIGATION OF THE PHYSICAL CHARACTERS OF THE HUMAN TEETH IN RELATION TO THEIR DISEASES, AND TO PRACTICAL DENTAL OPERATIONS, TOGETHER WITH THE PHYSICAL CHARACTERS OF FILLING-MATERIALS.

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(Concluded from page 661.)

### *Fifth Paper.**

### COPPER AMALGAM.

COPPER amalgam seems to have failed in the clinical trial that has been made of it in filling teeth. This failure is in the form of a loss of substance in those positions in which the surface of the filling is exposed to attrition in mastication. Generally, the material of the filling gradually washes away so that the surface is first cupped out, and finally the cavity is so nearly emptied of its contents that a new filling is required. For this reason the use of the material seems to have been abandoned by the profession. Yet this amalgam has so many good qualities that many abandon it with much regret. I think it is generally acknowledged that copper amalgam fillings retain good margins, when they are once made good, better or more perfectly than any other filling-material; and a study of the physical characters upon which this depends, and a comparison of these with the physical characters of other filling-materials, is a matter of much importance. I have had for examination a number of specimens of the material as furnished by the trade, and the effort has been to determine the physical characters which give it its good qualities rather than to discover a cure for its one evil,—its disposition to wash out.

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* The observation of the silver-tin amalgam fillings, reported in last month's issue of the COSMOS, has been continued. During the month no expansion has occurred in any of the fillings. Further contraction has occurred in the following fillings, all of the others having remained stationary:

*The first number will represent the formula, the second the number of the filling made from that formula, and the third the amount of contraction occurring during the month in ten-thousandths of an inch.*

3-1-1, 3-2-3, 4-4-2, 5-2-1, 5-3-2, 6-1-1, 6-2-1, 9-1-1, 10-2-2, 11-1-1, 12-1-1, 12-2-1, 13-1-1, 18-1-1, 19-1-1, 19-2-1.

Those sufficiently interested can note these on the diagrams of last month's issue and have them all together.

Test fillings, for determining its strength, were made, following the forms of manipulation usually used in making copper amalgam fillings. Specimen No. 1 was made into four series of fillings. First, the material as received from the dealer was heated in an iron spoon until mercury appeared on its surface, crushed in a mortar, and afterward kneaded in the hand until plastic. Fillings were then made in steel molds 85 x 85 x 85 thousandths of an inch, such as have been illustrated in connection with the silver-tin amalgam work. When these were fully set, they were crushed, and the number of pounds required to break them noted. Those made of the soft mass, as kneaded in the hand, crushed at a less stress than those made of the same material after it was wrung dry. The average crushing stress for those made soft was one hundred and seventy pounds, varying about twenty-five pounds for the different blocks, while fillings made from the same mass, worked dry as possible, bore a stress of from two hundred to two hundred and fifty-five pounds.

At this first working, a considerable mass was prepared and laid aside after being well kneaded. Two days later this was again prepared as at first, another series of fillings made, and the residue laid aside for another two days. This was repeated until the fourth series of fillings had been made from the same mass. Each series of fillings was found markedly weaker than the first. From a portion of the mass all of the mercury possible was wrung out, and more added after it had partially set. This seemed in some way to have a very deleterious effect on the material. The third series of fillings from this portion of the mass crushed at from thirty to forty pounds, while the fourth series could be crushed with the foil-pliers. From my experience with this specimen, it seemed to me that much of the wasting of copper amalgam might be explained by the looseness of the cohesion of its particles, caused by the re-working of the residue from former fillings.

A second sample was treated similarly in every respect except the addition of mercury, but the best fillings I could make from it would bear a stress of only one hundred pounds, while the majority crushed at from seventy-five to eighty pounds. This specimen did not, however, deteriorate so notably in re-working. Fillings from this mass would generally begin chipping from the corners under a stress of from twenty-five to forty pounds, and particles would fly off more and more until the whole mass would go to pieces.

The third and fourth samples were much alike. Both of these showed a strong reddish or copper color on being polished. They seemed rather coarser and more granular when kneaded in the palm of the hand than the other specimens. They were much stronger than the other samples. The blocks, 85 x 85 x 85 thousandths of an inch, made of the material well wrung out and strongly compressed into the cavity with a broad point, broke at a stress three hundred to three hundred and twenty-five pounds, while those made of the soft mass crushed at two hundred and twenty-five to two hundred and fifty pounds. The working properties of these samples were not quite so pleasant as those of some others, but their superior strength and toughness seemed to recommend them. The corners did not chip off from these as stress was applied, but when the crash came, the whole mass went to pieces together.

The other specimens examined were not essentially different from the first two samples ; the range of the crushing stress was generally between those two. The examination shows that there are some very important differences in the modes of the preparation of the copper amalgams. These cause a difference in the strength of the product, ranging from an average of about eighty pounds to three hundred and twenty pounds for blocks of the same size. This difference in the material was found at the first working after receiving it from the dealer. While all of the specimens showed a marked deterioration in strength from frequent reheating, this was much less in some than in others. This deterioration is sufficient to deter me from making use of any residue of copper amalgams in the future.

Tests of copper amalgam for flow gave one uniform result for all of the specimens. Copper amalgam does not flow ; it suffers no change of form under stress except to crush to atoms. After it has once fully set, its form cannot be changed by stress at all, not even a little. Within the limits of its strength it is as rigid as hardened steel. It will fly to pieces, but it will neither bend nor compress. As a filling-material it is absolutely rigid.

Tests for expansion and contraction were made by placing fillings in the Wedelstaedt steel test-tubes used in similar tests of the silver-tin amalgams. These were studied with the microscope and with the special micrometer with which a change of bulk of one ten-thousandth of an inch could be noted. No contraction was discovered in any of the copper amalgam fillings ; even those made very soft showed no contraction whatever. A very slight expansion was generally discovered ; but this was too slight to be of importance. In the large majority of the fillings it did not exceed two ten-thousandths of an inch. This occurred during the setting of the amalgam, and no disturbance of the margins could be discovered with the microscope. In one case there was an expansion of four ten-thousandths, and in one five ten-thousandths of an inch. In both of these fillings the rise of the material above the margins of the cavity was clearly seen with the binocular microscope, confirming the observations made with the special micrometer. As these were the only fillings in which such expansion occurred, and as I was unable to reproduce it, I failed to determine its cause. It is certainly rare that such an expansion occurs.

In making fillings of copper amalgam and examining the margins with the microscope, using a half-inch lens, I found some difficulty in getting the margins satisfactory when the material was used soft. It was readily pulled away from the margins here and there, in the endeavor to make a smooth surface, leaving gaps of some depth. I found that the easiest way to remedy this was to cut away the softened portion of the surface, filling in with a portion of harder material, and finish carefully without too much manipulation. Copper amalgam is peculiarly affected by manipulation, readily becoming jelly-like in consistence, in which condition it springs about in the most provoking way. Indeed, in trying to close a minute gap on one side of a cavity one is constantly in danger of producing a worse gap on the other side, or somewhere in the neighborhood. Even when harder material has been substituted, a little too much manipulation will render it as soft and jelly-like as the portion cut away; every condition, indeed, including the ease of making perfect margins and the strength of the filling, calls for thorough removal of the excess of mercury.

From the foregoing it is easy to understand why copper amalgam fillings, when well placed in properly-prepared cavities, retain their perfect margins and the color of the tooth-structure. The material is readily adapted to the walls of the cavity, and this adaptation is not broken up by the contraction of the mass in setting, as is the case with other amalgams. When it has once hardened in adaptation to the walls of the cavity, the adaptation is permanent. It does not suffer change of form under stress; and if the cavity has been properly prepared, the tooth-material is strong enough to support the filling against the stress of mastication. These physical conditions give copper amalgam fillings permanence, and fully explain that which has been seen in clinical observation. The power of the material in the arrest of caries is in these physical properties, not in any chemical or disinfectant property of the copper or its salts. These physical properties recommend this material so highly that it seems to me to call for a further study of the modes of production for the purpose of obtaining the material of maximum strength, and for the discovery of means of obviating the wasting from the surface of the fillings. In the first of my study of the material, as has been mentioned, it struck me that the wasting might be due to the looseness of the cohesion of its particles, or that it was purely a physical wearing away that could be obviated by a better mode of preparation. Further study, however, has caused me to doubt this. It seems more probable that the cause of the difficulty is a question for the chemist.

## Examination of Gold.

Outside of the uses made of gold in dentistry, it is practically unused in the arts in positions in which its strength becomes an important factor. For this reason it has not received that rigid physical examination to which iron and other metals and metallic compounds, used in structural work, ordnance, etc., have been subjected. However, in the books on the physical properties of the metals, occasional notes on the physical properties of gold occur. In these the conditions of the examination generally do not clearly appear, so that after consulting them one is but little the wiser. I speak of this because, as will appear later on, gold presents marked differences in the physical properties of hardness, resistance to compression, etc., according to the mode of its preparation for trial. Therefore, a simple statement that gold will be shortened five per cent. by so many pounds per square inch is not satisfactory. Indeed, for our uses we need to have statements of strength given in terms more nearly in correspondence with the masses of the material we use. Again, I have found no statements of the examination of the strength of masses of gold formed of the preparations of the metal as we use it in filling teeth.

In the examination of the resistance of the metals, it is the custom of physicists to form them especially for the purpose. For instance, in the examination of gold to determine how much it will yield to stress, it should be cast into bars of a given length, and then a certain portion of the central part of the length turned to gauge, and so much smaller than the unturned ends as to insure that all of the shortening by stress applied to the ends would occur in the smaller turned portion. The ends are also accurately squared so as to perfectly fit planes of steel between which the bars are compressed. Finally, the results are given in pounds per square inch, no matter what the size of the pieces examined. This manner of examination, though small pieces may be used, does not seem well adapted to our uses in the examination of the strength of gold fillings, for the reasons that it is difficult to form the material suitably without going much out of the methods used in filling teeth, and, as has been mentioned, that the statement of results seems far removed from the size of the masses we use. For these reasons, I have determined to make the statements of examination of gold in terms of one-tenth inch section or of masses one-tenth inch square, and to confine the examination to blocks of this size or near this size, always reducing statements of results to this size.

In the examination of these small masses, the same exactness cannot be attained as can be had with larger masses. For instance, when the proper apparatus has been provided, a length of five inches can be measured within one-thousandth of an inch almost or quite as accurately as a measurement of one-tenth of an inch can be made to within one-thousandth of an inch. An error of one-half of one-thousandth of an inch in the measurement of one-tenth of an inch length would be one-half of one per cent., while in the measurement of five inches a similar error would be only one-hundredth of one per cent. It must be understood that this kind of difference in exactness necessarily runs through all of this work with very small masses of material. But the conditions of the work and the uses which the results are expected to subserve demand the use of the small masses.

## CAST, HAMMERED, AND ANNEALED GOLD.

Gold as pure as the foil we use in filling teeth (clean foil scraps melted) was cast into bars in an ingot mold, used for forming bars for drawing wire. In taking the specific gravity of these, differences were noticed varying from 19.1 to 19.3. These differences, which occurred in the density of the cast bars, seemed to be caused by differences in the temperature at which the metal was poured, together with differences in the temperature of the ingot mold. Differences were also noted between the upper and lower ends of the bars. However, I did not follow out the causes of these differences so as to state them exactly, my object being only to determine the average strength of cast, hammered, and annealed gold for purposes of comparison with the strength of fillings made from the various preparations of gold in its different forms of manipulation.

*Case 1* of the exhibit. A cast bar which gave a specific gravity of 19.2 was turned in the lathe to an even size of one-hundred-and-forty-thousandths of an inch, and pieces cut of the lengths given in the exhibit and the ends accurately squared. Four of these were subjected to compression in the dynamometer with micrometer attachment, illustrated in the May issue of the COSMOS. The pieces were placed on their squared ends between parallel planes of steel, and the results of a stress of two hundred pounds and of three hundred pounds noted. There was an average shortening of the pieces under a stress of 200 pounds of 4.12 per cent. and under 300 pounds the average shortening was 11.21 per cent., the figures being reduced to the basis of an area of one-tenth inch section. The difference among the pieces cut from the same bar, though not very great, was quite notable. Such differences are constantly noted in the physical examination of the metals.

In *Case 2*, which gave the smallest percentage of shortening of any of the bars tried, there was an average of 1.04 per cent. at 150 pounds, 2.41 per cent. at 200 pounds, 9.95 per cent. at 300 pounds, and 14.43 per cent. at 350 pounds.

These two cases give a very fair view of the behavior of cast gold under compression. To give the results of other bars would furnish some variations without changing the general results.

It is well known that gold becomes stronger and somewhat denser by hammering or rolling, but I know of no accurate determinations appearing in dental literature. Our fillings of cohesive gold are, when completed, hammered gold; and should be very thoroughly hammered gold, for they are hammered little by little throughout their substance. For purposes of comparison, a number of bars were subjected to as thorough hammering as their size would permit. In *Case 3* of the exhibit the bar, after hammering, was turned to an even size of one-hundred-and-forty-thousandths of an inch and cut in pieces for test. The specific gravity of the bar, after hammering and turning, was found to be 19.3. The average shortening under a stress of 200 pounds was 0.48 per cent., at 300 pounds 1.98 per cent., at 350 pounds 3.89 per cent.

The same pieces were then annealed, and again subjected to the same stress. They were then found softer than any of the pieces that were tried in the condition in which they came from the ingot mold. The average shortening at 200 pounds was 6.17 per cent., at 300 pounds 12.70 per cent., at 350 pounds 16.47 per cent. The same change, in still greater degree, was noted in Case 4 of the exhibit. None of the pieces of hammered gold showed shortening at 150 pounds. Although I was prepared, by my experience in working gold, for a considerable reduction in its power of resistance by annealing, the difference shown surprised me, and I tried a considerable number of bars; but these developed nothing different from that given in the exhibit. The differences shown in the exhibit in the pieces cut from the same bar occurred in others as well. It is difficult to understand why these differences occur; no difference can be observed in the metal itself. To all appearance one piece is as perfect as another. None of the pieces showed any cracks or breaks. This kind of difference in behavior under compression or tensile stress is common to the metals. In the reports of tests of steel bars, of structural iron, of bronze, or of brass, these differences constantly crop out. I suppose, therefore, we should expect them in the noble metals as well.

This exhibit of the resistance of cast, hammered, and annealed gold pieces will give a basis of comparison with results of similar examinations of fillings made of the gold prepared for filling teeth.

EXHIBIT OF THE STRENGTH OF CAST, HAMMERED, AND ANNEALED GOLD UNDER COMPRESSION.

| All results reduced to the basis of one-tenth inch cross-section. | Number. | Length. | Weight. | Per cent. of shortening under a stress of | | |
|---|---|---|---|---|---|---|
| | | | | 200 lbs. | 300 lbs. | 350 lbs. |
| CASE 1. Cast gold, chemically pure. Specific gravity, 19.2; Diameter, 140. | 1 | 108.5 | 486.9 | 4.24 | 9.22 | ...... |
| | 2 | 107.5 | 481.9 | 4.27 | 12.16 | ...... |
| | 3 | 107.25 | 479.8 | 3.91 | 11.76 | ...... |
| | 4 | 106.0 | 477.8 | 5.07 | 11.70 | ..... |
| Average........................................ | | | | 4.37 | 11.21 | ..... |
| CASE 2. Cast gold, chemically pure. Specific gravity, 19.25; Diameter, 120. | 1 | 86. | 284.2 | 1.79 | 8.39 | 13.18 |
| | 2 | 101. | 339.7 | 4.08 | 8.66 | 17.34 |
| | 3 | 98. | 316.4 | 2.62 | 9.36 | 14.19 |
| | 4 | 83. | 274.5 | 1.85 | 9.30 | 13.03 |
| Average........................................ | | | | 2.58 | 8.92 | 14.43 |
| CASE 3. Hammered gold, pure. Specific gravity, 19.3; Diameter, 140. | 1 | 113. | 490.6 | 0.33 | 1.35 | 2.72 |
| | 2 | 121. | 534.3 | 0.63 | 2.53 | 5.07 |
| Average........................................ | | | | 0.48 | 1.98 | 3.89 |
| The same pieces annealed. | 1 | ..... | ...... | 6.34 | 12.70 | 16.23 |
| | 2 | ...... | ..... | 6.01 | 12.71 | 16.71 |
| Average........................................ | | | | 6.17 | 12.70 | 16.47 |
| CASE 4. Hammered gold. Specific gravity, 19.35; Diameter of pieces, 115. | 1 | 170. | 492.0 | 0.88 | 2.94 | 10.00 |
| | 2 | 121. | 372.4 | 0.40 | 1.64 | 6.14 |
| | 3 | 122. | 380.0 | 0.40 | 1.64 | 3.68 |
| | 4 | 109. | 323.5 | 0.53 | 2.24 | 7.13 |
| Average........................................ | | | | 0.55 | 2.08 | 6.73 |
| The same blocks after annealing. | 1 | ...... | ...... | 3.14 | 12.93 | 18.18 |
| | 2 | ...... | ..... | 6.75 | 14.41 | 19.36 |
| | 3 | ...... | ...... | 6.63 | 14.16 | 19.02 |
| | 4 | ...... | ...... | 5.06 | 13.76 | 19.22 |
| Average........................................ | | | | 5.39 | 13.38 | 18.94 |

## THE FLOW OF GOLD UNDER STRESS.

As stress upon gold is increased to a point at which it begins to show failure, or yielding, it begins to spread laterally. At first this flow is very slow; but, as the stress is increased, the flow occurs at a constantly-increasing ratio. This is well shown in the exhibit of the percentage of the yielding of cast, hammered, and annealed gold. For instance, the first number in Case 2 gave a flow of 0.59 per cent. at 150 pounds, 1.79 per cent. at 200 pounds, 8.39 per cent. at 300 pounds, and 13.18 per cent. at 350 pounds. No flow was found at 100 pounds; but in the next 50 pounds, after passing 150 pounds, there was 1.20 per cent. flow, while between 200 and 300 pounds the flow was 6.50 per cent., and between 300 and 350 pounds the increased flow was 4.89 per cent. An examination of the exhibits will show that this progressive increase in the flow has been common to all of the forms of gold, including cohesive gold fillings. The flow is not steady, but is inclined to be irregular, going rapidly for a little time and stopping, then flowing again. This seemed to occur, no matter how steadily the stress was increased. It seems to be for this reason mainly that the irregularities in the figures representing the yielding occur. For this reason a single case does not always give a fair showing of the strength of the material; for, by placing a rating on a piece of gold, or a filling that flows very little at, say, 200 pounds, we may greatly overrate the average strength of gold. Also, for practical purposes, we must always calculate that some pieces will fail at a much less stress than the average of many pieces. The same is true of fillings made in any definite way as nearly alike as possible; indeed, cohesive gold fillings behave under stress precisely as any other gold, except that they may be less dense. In the main, the strength of cohesive gold fillings is in close agreement with their density.

The flow of gold under static stress was carefully noted in many cases. No flow occurs until the stress has reached a point at which the gold really begins to fail, or until the flow under increasing stress has reached four or five per cent. If the increase of stress is stopped before that period, the needle of the micrometer usually stops at once; but when a much greater stress has been applied, there occurs a continued flow for a little time after the increase of stress has ceased. This may be one or two per cent. within ten minutes, and perhaps as much as one per cent. within the next hour, after which the needle remains stationary. There is no such continued flow under static stress as occurs in the silver-tin amalgams.

## Gold Fillings.

Gold fillings for purposes of test were made in the steel apparatus illustrated in the July issue of the Cosmos. The greater number of these were made in a cavity one-tenth of an inch square, or in a round cavity giving the same area in cross-section, but a considerable number were made in larger cavities. These fillings were made by myself, by others in Jacksonville, in Chicago, and in St. Paul, Minn., the intention being to illustrate in some degree the personal equation in the packing of gold. It was anticipated that this personal equation would be large, and a study of the exhibit presented will show that I was not mistaken. It was also the intention to illustrate in some degree the value of the different plans of packing gold, but a study of the personal equation with the ordinary hand mallet will show, I think, that but little of the differences shown in the exhibit can safely be attributed to the special instruments employed for condensation. In order to accurately study the effectiveness of the different instruments for the condensation of gold foil, it seems to me that they should be used by persons who are accustomed to use two or more forms of apparatus and the results compared. When fillings have been made in this way by a number of persons and the results accurately studied, questions of effectiveness can be arrived at with some degree of certainty.

Several points in the table require explanation. As the fillings came to me with the explanation of the mode of procedure in packing the gold, I found many of them imperfect in the adaptation of the gold to the walls of the cavity. It had been the intention to determine the density of each filling by taking its specific gravity by the regular process of weighing in air and in distilled water. But by this process imperfections on the surface of the fillings would be eliminated by filling with water. For this reason the density or specific gravity had to be determined by weight in air and the determination of bulk by measurement. By measurement in millimeters, calculating the cubic contents and multiplying this by the maximum density of gold, the weight of the mass considered as gold of maximum density is obtained. This I will call the *theoretic weight*, or the weight of maximum density. Then with the weight of the filling in milligrams, it is but a simple proposition in proportion to determine the actual specific gravity of the filling. The actual weight is multiplied by the specific gravity of gold of maximum density and divided by the theoretic weight. The result is the specific gravity of the filling.

Or, as each filling made in a steel mold would necessarily be of the same dimensions in cross-section, only the length required to be measured. One would hardly expect that this would be required, but I found there was considerable difference in the length to which the fillings were finished. In all trials of compression the fillings were placed on end, and, as the length was measured and the results given in percentage of shortening, this difference in length was of no consequence. This much determined, it was easy to find a factor by which to multiply the length of the filling and arrive at the theoretic weight by a shorter method. But what should be regarded as the standard of density of gold fillings? Should it be the density of cast bars, or of hammered gold? To determine this, I packed annealed gold into a steel mold with a heavy mallet, using sufficient force to insure fairly complete condensation. This filling is given as No. 1 of the exhibit. The determination of its specific gravity by the regular process gave 19.38. Another filling was made in the same way and the gold heaped up more than full, and then the mold was placed on an anvil and the gold struck several heavy blows with a hammer. This filling gave a specific gravity of 19.42. Both of these show a greater specific gravity than 19.3, which is usually given for hammered gold, though some authors give 19.4. Regarding the second of these fillings as probably representing the greatest density possible to gold, a mean between the two, or 19.4, was chosen as the standard of maximum density to be employed. Then the weight of these fillings was divided by their length, and the result used as a factor by which to multiply the length of other fillings made in this cavity to obtain the theoretic weight. These measurements were as close as one-half of one-thousandth of an inch. A similar factor was found for each cavity employed. A number of fillings that presented perfect surfaces were examined by both methods—this form of measurement and the regular method—and the differences in result were so small as to be reasonably satisfactory.

In the exhibit the reader will find a brief account of the manner of putting in each filling, which has been condensed from the report furnished by the operator. The actual weight of the filling and the theoretic weight are each given in milligrams, followed by the specific gravity, or density, and the per cent. of air-spaces contained in the filling. In the next three columns will be found the per cent. of shortening under a stress of 200 pounds, 300 pounds, and 350 pounds for about half of the fillings. For the others the per cent. of shortening is given for 150 pounds and 200 pounds. For reasons which appear to me sufficient I have omitted the names of the operators and have represented each by letters, as *A*, *B*, *C*, etc.

The steel slab in which the cavities filled are held weighs eleven ounces. It was thought by some that by laying this on a table the blows of the mallet would be more than ordinarily effective, and in many cases it was laid on cushion. This is noted in the exhibit when I had the information.

On entering the study of the table the reader should note carefully the manner of making each filling, and make his own deductions as to what the results should be by the method employed. Next he should note carefully the difference between the actual weight of the filling and the theoretic weight. This last is the weight of an equal bulk of gold of maximum density, or is the weight of gold that could be put into the space occupied by the filling with a heavy hammer. The statement of the density, or specific gravity, and of the percentage of air-spaces which follow, really add nothing new, as they are calculated from the weights. To many, however, they may give a clearer expression of the facts than the weights themselves. The results of stress in shortening the fillings should be carefully compared with the density attained. It will be instructive to study carefully the results attained by each operator by the methods he employed, and to make comparisons.

EXHIBIT OF THE STRENGTH OF GOLD FILLINGS UNDER COMPRESSION.

| | Number. | Actual Weight. | Theoretic Weight. | Specific Gravity. | Per cent. of Air Spaces. | Per cent. of Shortening under Stress of | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 200 lbs. | 300 lbs. | 350 lbs. |
| FILLINGS one-tenth inch cross-section. BLACK. | | | | | | | | |
| Gold foil. Heavy mallet used with the intention to produce maximum density.......... ........ | 1 | 316.0 | 299.7* | 19.38 | 0.0 | 0.0 | 0.9 | 2.7 |
| Gold foil—as in No. 1, except that hammer was used........ | 2 | 320.5 | 304.0* | 19.42 | 0.0 | 0.0 | 1.0 | 2.0 |
| Gold foil No. 4, in 1-32 sheet pieces. Mallet force as in building fillings exposed to unusual stress. Slab on table.................................. | 3 | 291.2 | 294.5 | 19.18 | 1.1 | 0.0 | 1.9 | 3.9 |
| Same as No. 3, only in round cavity and filled more rapidly. Slab on table................ | 4 | 296.0 | 308.4 | 18.61 | 4.0 | 0.4 | 3.7 | 9.4 |
| Gold foil No. 4, in 1-32 sheet pieces. Mallet force as in filling teeth. Slab on cushion.. | 5 | 283.0 | 314.6 | 17.4 | 10.3 | 1.3 | 6.4 | 12.9 |

* Weight in distilled water.

EXHIBIT OF STRENGTH OF GOLD FILLINGS.—*Continued.*

| | Number. | Actual Weight. | Theoretic Weight. | Specific Gravity. | Per cent. of Air Spaces. | Per cent. of Shortening under Stress of | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 200 lbs. | 300 lbs. | 350 lbs. |
| Two half-sheet cylinders of No. 4 foil—non-cohesive—placed in bottom of cavity, filling it nearly full. Cohesive foil malleted upon them. Slab on cushion........................ | 6 | 279.8 | 300.3 | 18.0 | 7.2 | 19.4 | 39.8 | 44.6 |
| ¼ sheet cylinder non-cohesive foil No. 4 laid in bottom of cavity and cohesive foil malleted over it. Slab on cushion ........................ .......... | 7 | 297.0 | 314.6 | 18.3 | 5.6 | 0.9 | 7.3 | 13.8 |
| Platinum gold folds, crumpled and used in blocks, all annealed, mallet force ordinary. Slab on cushion.. ...... | 8 | 279.5 | ....... | ....... | ...... | 1.1 | 4.8 | 8.5 |
| Platinum gold folds; used flat, ordinary mallet force. Slab on cushion........................ | 9 | 272.0 | ....... | ....... | ...... | 3.7 | 7.0 | 11.3 |
| Williams's platinum gold foil No. 60, mallet force as in building surfaces much exposed to wear. Size of point 1 x 3.5 hundredths of an inch. Slab on cushion.................. | 10 | 328.0 | ....... | ....... | ...... | 0.0 | 0.8 | 2.2 |
| Same as No. 10, only the point was 3 x 3 hundredths of an inch. Slab on cushion......... | 11 | 312.2 | ....... | ....... | ...... | 0.0 | 0.9 | 1.6 |
| FILLINGS BY DR. A.—Size of cross-section one-tenth inch. | | | | | | | | |
| Williams's A cylinders, Nos. 1 and ½, annealed, ordinary mallet force. Slab on table.. | 12 | 270.0 | 314.2 | 16.6 | 14.6 | 8.0 | 16.1 | 21.9 |
| White's corrugated gold, all annealed. Slab on table...... | 13 | 252.4 | 308.8 | 15.8 | 18.5 | 10.4 | 25.7 | 30.4 |
| 120 gold foil, annealed, ordinary mallet force. Slab on bracket.............................. | 14 | 281.2 | 314.6 | 17.3 | 10.8 | 5.0 | 13.4 | 19.4 |
| White's A cylinders, unannealed, hand pressure. Slab held in the hand.................. | 15 | 224.4 | 298.2 | 14.6 | 24.6 | 31.1 | 40.2 | 44.1 |
| FILLINGS BY DR. B.—Size of cross-section 1-10 inch, except No. 18, which was 134 x 129 thousandths of an inch. | | | | | | | | |
| Foil mostly annealed, force partly hand and partly mallet, finished with No. 10....... | 16 | 221.0 | 291.7 | 14.6 | 24.6 | 15.1 | 23.2 | 28.2 |
| Cohesive No. 4 foil and mallet, with ordinary force. Slab on table.............................. | 17 | 250.0 | 305.5 | 15.8 | 18.5 | 8.8 | 15.6 | 20.5 |
| Non-cohesive foil cylinders and hand pressure, finished with cohesive foil and mallet | 18 | 487.4 | 646.0 | 14.6 | 24.7 | 8.2 | 20.6 | 34.6 |

EXHIBIT OF STRENGTH OF GOLD FILLINGS.—*Continued.*

| | Number. | Actual Weight. | Theoretic Weight. | Specific Gravity. | Per cent. of Air Spaces. | Per cent. of Shortening under Stress of | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 200 lbs. | 300 lbs. | 350 lbs. |
| FILLINGS BY DR. C.—1-10 inch cross-section. | | | | | | | | |
| Pack's cylinders annealed, some soft foil in beginning. Slab on cushion.................. | 19 | 260.5 | 320.1 | 15.7 | 19.0 | 6.3 | 16.6 | 22.0 |
| Kearsing's blocks, annealed, mallet force ordinary. Slab on cushion.......................... | 20 | 222.8 | 294.5 | 14.7 | 24.2 | 13.8 | 26.7 | 32.6 |
| FILLINGS BY DR. D.—1-10 inch cross-section. | | | | | | | | |
| Pack's cylinders, size 1 x ½, annealed, ordinary mallet force. Slab on cushion....... | 21 | 328.2 | 361.7 | 17.6 | 9.2 | 0.9 | 1.8 | 2.7 |
| FILLINGS BY DR. E.—1-10 inch cross-section. Slab laid on the table. | | | | | | | | |
| No. 4 foil, annealed. Filling made slowly with rather more than ordinary malleting.................................... | 22 | 213.8 | 322.1 | 18.9 | 2.5 | 0.6 | 1.3 | 2.7 |
| Made in the same manner as No. 22, but in a round cavity. | 23 | 311.6 | 328.5 | 18.4 | 5.1 | 0.9 | 1.8 | 2.8 |
| Crumpled foil No. 4, annealed, ordinary force. Slab on table. Filling made quickly, time 18 minutes.................... | 24 | 267.0 | 314.6 | 16.4 | 15.4 | 5.5 | 14.8 | 20.3 |
| Same as No. 24 except that it was in a round cavity, time 17 minutes.......................... | 25 | 273.1 | 314.4 | 16.8 | 13.4 | 3.8 | 7.2 | 17.3 |
| FILLINGS BY DR. F.—The slab was on a table. Nos. 26, 27, diameter 92. Nos. 28, 29, 1-10 inch section. | | | | | | | | |
| Platinum gold folds, annealed, used flat. Pneumatic mallet, ordinary force, with Royce point.................................... | 26 | 191.5 | ....... | ....... | ...... | 0.6 | 5.3 | 9.3 |
| Pack's cylinders, annealed. Pneumatic mallet, ordinary force, with Royce point....... | 27 | 192.6 | 199.7 | 18.7 | 3.6 | 1.6 | 10.5 | 17.3 |
| Platinum gold folds, shade 2, annealed and used flat. Snow & Lewis's automatic mallet, ordinary force, Royce point.................................... | 28 | 290.0 | ....... | ....... | ...... | 1.9 | 4.5 | 8.1 |
| Rowan's decimal gold foil, crystalline surface, unannealed. Snow & Lewis's automatic plugger, ordinary force, Royce point................ | 29 | 299.0 | 317.4 | 18.2 | 5.6 | 0.9 | 2.2 | 12.8 |

EXHIBIT OF STRENGTH OF GOLD FILLINGS.—*Continued.*

| | Number. | Actual Weight. | Theoretic Weight. | Specific Gravity. | Per cent. of Air Spaces. | Per cent. of Shortening under Stress of | |
|---|---|---|---|---|---|---|---|
| | | | | | | 150 lbs. | 200 lbs. |
| FILLINGS BY DR. G.—Diameter 143 thousandths of an inch. | | | | | | | |
| Gold foil No. 4, ⅛ and 1-16 sheet pieces, leather end mallet, with ordinary force... | 30 | 466.7 | 546.8 | 17.0 | 12.3 | 3.33 | 4.45 |
| Same as No. 30, only that hand pressure was used instead of the mallet........................ | 31 | 355.8 | 571.5 | 12.0 | 38.1 | 9.79 | 18.83 |
| Gold foil No. 4, 1-32 sheet pieces, automatic mallet, 25 blows on each piece, short blow, full force.................... | 32 | 332.4 | 552.5 | 12.5 | 35.3 | 6.90 | 16.88 |
| Same as No. 32, except that each piece was given fifty blows................................ | 33 | 406.0 | 560.0 | 14.0 | 27.8 | 0.75 | 1.50 |
| FILLINGS BY DR. H.—Diameter 143 thousandths of an inch. | | | | | | | |
| Rowan's decimal cylinders, mostly unannealed, hand pressure, except at last........ | 34 | 505.0 | 576.8 | 16.9 | 12.8 | 0.0 | 0.0 |
| Williams's gold No. 4, 1-32 sheet pieces in balls. Hand mallet, fifty blows on each piece, ordinary force.......... | 35 | 525.0 | 584.6 | 17.4 | 10.3 | 0.0 | 0.0 |
| FILLINGS BY DR. I.—Diameter 143 thousandths of an inch. Fillings made with Bonwill mechanical mallet—⅙ horse-power motor. | | | | | | | |
| Foil No. 4, 1-16 and 1-32 sheet pieces, strong blow. serrated point...... ............................ | 36 | 442.0 | 575.5 | 14.9 | 23.2 | 0.18 | 2.19 |
| Same as No. 36, but blow was increased—much too hard for filling teeth..... .............. | 37 | 450.7 | 565.4 | 15.4 | 20.6 | 0.0 | 0.74 |
| Same as No. 37, but with smooth point ....................... | 38 | 504.5 | 565.4 | 17.3 | 5.6 | 0.0 | 0.36 |
| Kearsing's gold blocks, ⅓ unannealed, hand pressure, ⅔ annealed and malleted........ | 39 | 412.0 | 549.9 | 12.7 | 34.5 | 2.27 | 4.17 |
| Same as No. 39, except that Rowan's decimal cylinders were used.......................... | 40 | 480.0 | 575.6 | 15.1 | 22.1 | 0.72 | 1.35 |
| FILLINGS BY DR. J.—Diameter 143 thousandths of an inch. Electric mallet, 110 volt Edison current. | | | | | | | |
| Gold rolls, all annealed, medium size, serrated plugger.. | 41 | 386.3 | 565.4 | 13.2 | 31.9 | 7.49 | 14.73 |
| Gold foil No. 4, annealed, 1-32 sheet pieces, and 15 seconds time given to each piece······ | 42 | 279.0 | 502.7 | 10.7 | 44.8 | 32.37 | 42.40 |

EXHIBIT OF STRENGTH OF GOLD FILLINGS.—*Continued.*

| | Number. | Actual Weight. | Theoretic Weight. | Specific Gravity. | Per cent. of Air Spaces. | Per cent. of Shortening under Stress of 150 lbs. | Per cent. of Shortening under Stress of 200 lbs. |
|---|---|---|---|---|---|---|---|
| Gold foil No. 4, annealed, 1-32 sheet pieces, 15 seconds time given to mallet on each piece | 43 | 358.0 | 544.8 | 12.7 | 34.5 | 19.48 | 27.73 |
| FILLINGS BY DR. K.—Diameter 143 thousandths of an inch. Made with Bonwill mechanical mallet, timed to 15 seconds on each piece of gold; it might be more, but not less. | | | | | | | |
| Gold foil No. 4, 1-32 sheet pieces, annealed, medium large serrated point | 44 | 460.6 | 601.3 | 14.8 | 23.7 | 3.43 | 13.6 |
| Gold foil No. 4, 1-32 sheet pieces, annealed, medium large smooth point | 45 | 460.7 | 606.5 | 14.7 | 24.2 | 6.70 | 20.9 |
| FILLINGS BY DR. L.—Diameter 143 thousandths of an inch. | | | | | | | |
| Gold foil No. 4, annealed, 1-32 sheet pieces. Hand mallet by assistant, 50 blows on each piece | 46 | 514.0 | 565.4 | 17.6 | 9.2 | 0.0 | 0.0 |
| Gold foil No. 4, annealed, 1-32 sheet pieces. Pneumatic mallet, 25 blows on each piece | 47 | 286.0 | 514.0 | 10.7 | 43.2 | 19.9 | 30.5 |
| Gold foil No. 4, annealed, 1-32 sheet pieces. Pneumatic mallet, 50 blows on each piece | 48 | 537.0 | 549.9 | 18.9 | 2.5 | 0.0 | 0.75 |

Generally no control whatever was exercised over the manner of making fillings further than the statement that I wished to represent the density and strength of gold fillings made by various persons and by various methods, and for that reason I wanted a statement of the method by which each filling was made. During the progress of the work I became deeply conscious of the fact that we have no means of exactly expressing the force employed in making fillings. It can scarcely be said that we can express it approximately. One man knows little of the effectiveness of the force used by another in packing gold. We have no means of knowing the effectiveness of points of different forms or of different sizes, except that of very inexact clinical observation; and in this regard but little has been attempted in this investigation. Yet we know that the size of the point and the number of blows delivered must exercise an important influence over the density of the filling. With a given blow of the mallet the force actually delivered upon the gold with a point two-hundredths of an inch square will be four times as great as with a point four-hundredths of an inch square. Yet a point that cuts the gold, instead of packing it, becomes ineffective.

Dr. Wedelstaedt, of St. Paul, who has assisted me in the collection of these fillings, has made considerable effort to determine the effectiveness of blows delivered in packing gold by noting the results attained by delivering a certain number of blows on each piece of a given size, and afterward making another filling, using a different number of blows on each piece. One example of the results is given in Nos. 46, 47, and 48, all of which were made by the same person, and another in Nos. 30, 31, 32, and 33. The idea of counting the *time* of malleting of each piece of gold with those mechanical mallets that deliver blows in rapid succession was also tried, and some of the results are given in Nos. 41, 42, and 43. All of this requires to be tried, however, more systematically and on a much larger scale than has been possible in this study in order to arrive at valuable results.

I have watched operators packing gold in a number of the fillings given in this exhibit, and tried to form an estimate of the density of the filling. While in the main I have arrived at some degree of correctness, in a number of instances I have been greatly deceived. There seems to be quite as much in the handling of the gold, in the placing of it, and in the particular method used in applying the force as in the amount of the force, provided, of course, that it is not so excessive as to spread the condensed material. In this I do not refer to the kind of instrument used, but to the dexterity of the operator. In the examination of the exhibit, fillings will be found that gave great resistance to compression, fillings that were really very hard, but which fell much below the maximum specific gravity. In these, while the gold was solidly packed in the main, or, rather, made very hard by malleting, there were many nooks and corners not filled. The adaptation to the cavity-walls was very imperfect. It was this imperfection in manipulation that caused the large amount of air-space, not the lack of force in condensation ; and, therefore, while the filling was of good strength, it was really very imperfect. This is strongly illustrated in Nos. 34 and 35, in No. 33, and in less degree in others.

On the other hand, I found some fillings that gave very perfect surfaces, as examined by the naked eye and by the hand lens, that were weak. This was especially true of the non-cohesive gold fillings, but it was also true of some of the cohesive gold fillings. This was especially notable in filling No. 13. This filling was selected as one of the most perfect fillings in its surfaces for trial of its specific gravity by weighing in water, and from its appearance I supposed it to be a very dense filling. But the result showed it to be lacking in density, giving 18.5 per cent. of air-spaces, and it was correspondingly weak under stress. Still, the manner of the manipulation was such as to give very perfect adaptation to the walls of the cavity. This was noted as being peculiar to certain operators.

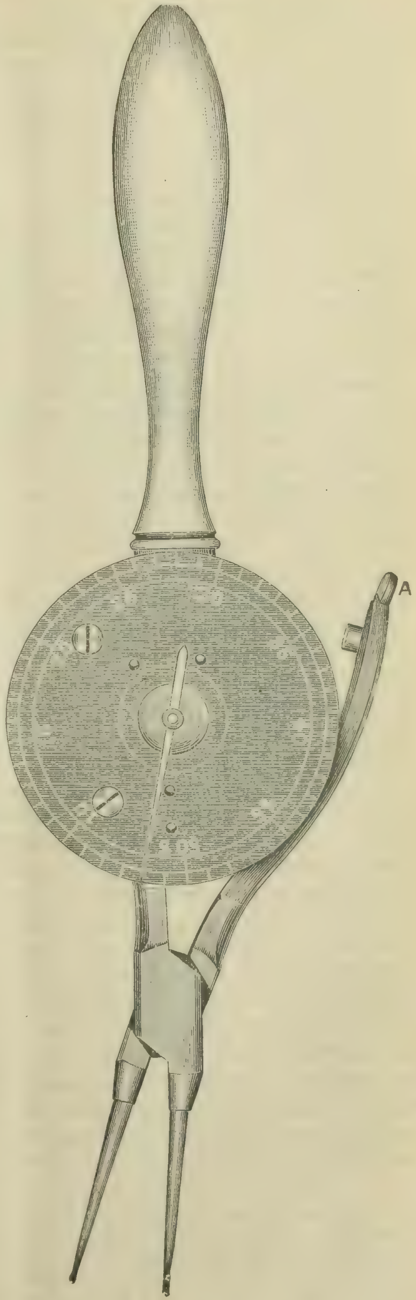
It will be seen from what has been said that to obtain great density is but one element in packing gold. Imperfection in the adaptation of the gold to the margins is fully as serious an objection to a filling as insufficient density. The acquiring of hardness of the gold is merely a matter of application of force. With the use of medium force, the avoidance of air-spaces of more than a certain per cent. is a matter of method and skill in handling the material. The same method and skill makes perfect adaptation to walls. Undoubtedly, many operators fail from the avoidance of the use of sufficient force in their desire to favor their patients. To make sufficiently dense fillings, a certain amount of force must be employed, but it is not necessarily very great. When this amount of force is used, the results depend on the skill displayed in its application, the value of the filling depending much more on the skill in placing the material and the direction and order of the application of the force than on great force.

In the study of the fillings presented, it will be noticed that those made of non-cohesive gold are much less dense than those made of cohesive gold. Compare the fillings made by A and B. I made a number of non-cohesive gold fillings myself by the old method of wedging, using hand pressure only and purely non-cohesive gold, to see what density I could obtain. I found that about sixteen was the best I could do with a force that would be admissible in filling teeth. These fillings went to pieces with a very light stress, the cylinders around the corners giving way and spreading out. When non-cohesive gold in moderate amount in the form of cylinders is laid flat in the bottom of the cavity and the filling made by malleting cohesive gold over it, the strength of the filling is not notably diminished. This is fairly shown in No. 7, in which a fourth of a sheet of No. 4 foil, purely non-cohesive, rolled into a cylinder, was placed in the bottom of the cavity. But in No. 6, in which a full sheet was placed in the bottom of the cavity and cohesive gold malleted over it, the strength was notably less, although nearly the same density was attained. It is impracticable now to say what this difference would have been had the non-cohesive gold been supported by three walls of a cavity. But even then there can be no doubt that the filling would have been markedly weaker than if it had been built of cohesive gold entire.

Of course, it must be understood that fillings made of purely non-cohesive gold depend upon the support of the walls of the cavity for their strength, and tests of the naked fillings are of little value, but the facts developed in this way may be instructive to many in the placing of non-cohesive gold in the beginning of fillings in proximate cavities. It shows that it must be used in moderate amount, and so placed that it will be properly supported, or the strength of the filling will be notably impaired.

A careful review of the strength of the fillings presented in this exhibit, together with a review of the article on the force exerted in the closure of the teeth in the June issue of the COSMOS, will, I think, convince any one that many of the gold fillings have not strength enough to stand continuously in occluso-proximate surfaces, or in any positions in which they are supported by the cavity-walls on two or three sides only. It is doubtful if the weaker ones are strong enough to stand continuously in occlusal cavities where they have the support of four good walls. We should provide, certainly, for a stress of one hundred and fifty pounds on our fillings, and in extreme cases for a greater stress. It is true that in many cases such a stress will not be brought upon fillings, but it is equally true that in the present state of our knowledge of individuals and their habits in mastication, we cannot certainly determine when a weaker filling will be successful. In reasonably favorable cases, gold fillings ought to be made to stand indefinitely. The teeth are strong enough, and the gold can be made strong enough. It can also be perfectly adapted to the walls of cavities so as to be water-tight, and perfectly exclude the agents that produce caries, and protect the tissues of the tooth.

FIG. 15.*



A review of the fillings of the exhibit shows a very large per cent. of failure to produce fillings that are sufficiently strong. Clinical observation teaches the same thing in terms that seem to me definite and decisive. I would not be understood, however, as placing all failure of fillings at the door of insufficient condensation. This is only one of many causes of failure. Want of method in the packing of the gold, resulting in imperfect adaptation to the walls of cavities,—leaky fillings,—accounts for many failures. Faulty methods in the preparation of cavities is another very large element in the failure of fillings. A large proportion of operators do not give sufficient attention to the position of the margins of their cavities with reference to rendering them self-cleaning, hence in cases in which there is a strong disposition to caries, recurrence of decay, with final loss of the filling, will occur, though the filling may have been otherwise good. Failing fillings are constantly presenting, which upon careful examination prove to have been put in cavities improperly prepared in that the seat of the filling was insufficient to give a sufficient area of gold to support the stress brought upon its occlusal portion in mastication. The instrument illustrated in Fig. 15

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*Fig. 15 is reproduced from the August DENTAL COSMOS, where it was inadvertently printed out of its proper place. It represents a *Cavity Micrometer*, full size,—an instrument for the accurate measurement of cavities in the teeth, for determining the area of ex-was constructed especially for the accurate examination of the different portions and proportions of cavities with reference to their adaptation to the support of stress, and this phase of the subject has had careful attention. When stress is brought upon a filling in the chewing of food, it is in turn borne by some portion or portions of the walls of the cavity, generally by that portion of the wall which is perpendicular to the line of stress. In occluso-proximate cavities this is the gingival wall, and the area of gold which rests upon that must support the stress, unless an additional seat has been formed in the occlusal portion of the crown of the tooth.

In order for gold to safely support a stress of one hundred pounds upon an area one-tenth of an inch square, it must have a density of about 17, and be pretty well hardened by malleting. This is one pound to each one-hundredth inch square. If we obtain a flat gingival wall in a proximate cavity in a bicuspid tooth of only five-hundredths of an inch in breadth (one-twentieth of an inch), it will have to be full two-tenths of an inch long for the gold placed upon it to support one hundred pounds stress, and to make it support one hundred and fifty pounds is out of the question. Besides, it requires skillful manipulation to attain that degree of density and hardness in such a position. It may be true that a cavity may be so prepared that a part of the load will be borne by the buccal and lingual walls; but the habit of many operators is to so prepare these cavities that much of these walls is really more or less undercut, so that, instead of assisting to support the load, they are so formed that the least yielding of the gold on the seat of the filling causes the gold to be carried away from these walls, causing a leak which ultimately destroys the filling. With a knowledge of the strength of gold and of the stress that is liable to be brought upon it, one can so prepare cavities and fill them that there will be no giving way. Really, gold is the king of filling-materials; and yet to avail ourselves fully of its good qualities requires a clear view of its physical properties and a close apprehension of the forces at play in the process of mastication. The means of resisting the physical force of mastication, as it is brought to bear day after day, lies largely in the forms given to cavities in their preparation. Otherwise the strength of gold will be insufficient in many positions. In proximate cavities of which I have spoken, and in which there has been the greatest difficulty as to the support of fillings, it is the habit of many operators to cut an additional seat in the occlusal portion of the crown of the tooth on which to support a large portion of the stress. When this is generally done with a clear apprehension of the forces and a broader appreciation of the resistance of materials, we will hear of less difficulty in making proximate fillings stand.

It is still the habit of many operators to use pits and grooves in the

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posure to the stress of mastication, and for determining the area of *the seats* of fillings; or the area of that portion of the cavity which must carry the stress placed on the filling. The points of the instrument are bent at an angle of forty-five degrees, which could not be well shown in the photograph. In use the thumb is placed on the thumb-piece (A), and the points closed. The points are then placed in the cavity in the position desired, and the thumb-piece released. A light spring carries points against the opposing wall of the cavity, and the index needle shows the measurement in hundredths of an inch.

buccal and lingual walls of proximate cavities with the view of sustaining fillings. Suppose a groove is cut one-hundredth of an inch deep and seven-hundredths of an inch long, the most it could support would be about seven pounds. But can the gold be so condensed into such a position as to attain this strength? If so, it will require that the instrument be specially adapted to the groove and the gold condensed with much care, and then its sustaining power will be insufficient to do much toward the support of the filling against the tipping stress that tends to turn it out of the cavity, and it is almost useless in sustaining the direct stress. One groove of this dimension in the buccal and one in the lingual wall of a bicuspid cavity would, as grooves are cut, be very efficient grooves, and sufficient to very materially weaken these walls. The most that the two combined could be expected to sustain would be fourteen pounds. The filling would not be thrown out of the cavity by this stress; but with a trifle greater stress the filling would start, the margins become leaky, and its complete destruction would be but a matter of time. In the teeth of persons who habitually or often crush down upon food with a force of one hundred and fifty pounds, fillings in proximate surfaces supported on the gingival wall of the cavities, assisted by grooves in the buccal and lingual walls, cannot be expected to stand for any great length of time.

As to pits, it is not difficult to measure, or even to estimate, their area with sufficient correctness to find that they must be ineffective. However convenient pits and grooves may be in starting and building fillings, the idea that they are effective in sustaining the filling in position should be forever abandoned by all, as it certainly has been, on account of the clinical observation of their failure, by many in the profession. Proximate fillings are safely anchored only by so forming the cavity that the seat of the filling is sufficiently broad and flat for the gold condensed upon it to safely support the stress brought upon its occlusal surface: not merely the stress of ordinary mastication, but also any extraordinary stress to which it is liable. When this cannot be made sufficient on the gingival wall (and it is rare that it can), the additional seat in the occlusal portion of the crown already mentioned should be added.

Fillings of the solid materials, as cohesive gold and the silver-tin amalgams, fail differently from the non-cohesive gold fillings of by-gone days. These latter failed by the loosening of some portion of the mass, after which the rest crumbled out. The solid fillings do not often fall out of the cavity without some break of the tooth or very radical defect in the construction of the filling. If they fail otherwise than from imperfect removal of carious material in excavating, imperfect cavity-margins, or imperfect adaptation of gold to margins, they *fail by movement of the mass as a whole;* that is, stress is brought upon the filling in such degree that the material on the seat of the filling yields, and the whole filling moves. Such movements are usually much too slight to be discovered by the naked eye, and may go on little by little for weeks and months without discovery. Finally, the filling is discovered to be leaky about some portion of its margins. The filling is still firm, and if the movement is not great it will remain firm until decay has become re-established and the filling has to be removed. One of the best places to observe this movement of gold fillings is in proximate fillings in the bicuspids that have been retained by grooves in the buccal and lingual walls, and which present some surface to the occlusal that takes the stress of mastication. Generally, after these have been in position for some years, more or less, there begins to appear a line of imperfection along the occlusal margin. At first the gold seems not quite close, after a while the imperfection is decided, and finally it is a black line. The filling has moved away from the wall. Movements of this kind may be noted in any of the positions in which fillings are exposed to the stress of mastication, but less often than in the bicuspids, for the reason that in other positions the seats of fillings are generally broader. These movements are from insufficient breadth of seat, or from insufficient condensation of gold, or from both.

The question of using alloys of gold for the purpose of obtaining a harder filling comes up for consideration. This would seem desirable in many cases where fillings will be subjected to unusually severe stress. I have made much use of the platinized gold folds and the platinum gold folds as made by R. S. Williams, in positions exposed to unusual wear, and from clinical observation should say that they make a surface that stands the abrasive action of mastication much better than pure gold. A trial of the strength of fillings made entire of the folds has been disappointing. These will be found in Nos. 8 and 9 and in Nos. 26 and 28 of the exhibit. In the fillings I made myself, no advantage in strength was shown. The other numbers were made in pairs with fillings of pure gold, the same instruments being used in making each pair and the same process of manipulation followed as closely as possible. In these the greater strength is with the platinum gold. I also tried two fillings of No. 60 foil made from gold and platinum, which are given in Nos. 10 and 11. This has produced very resistant fillings. They were made with as nearly as possible the same force as that used in filling No. 3, and the difference in resistance is markedly in favor of the platinized gold, though the difference is not so great as I had expected. I did not undertake to determine the specific gravity of these materials in order to fix the theoretic weight; therefore, the percentage of air-spaces was not determined. I have reason to believe, however, that the air-spaces in these fillings are not greater than in the gold fillings similarly made.

In the fillings made by myself of the gold platinum folds, I am inclined to attribute the weakness of the one in which the material was used flat to insufficient annealing. For this filling the material was annealed on a mica slab, while for the other filling it was annealed in the flame of the lamp. The thought of a careful test of the effect of the temperature at which gold is annealed has come too late for the purposes of this article, but in studying the results in my own fillings and in others, the making of which I closely watched, I have arrived at the opinion that a denser and harder filling can be made if the gold is annealed at a high temperature.

In concluding this series of articles, I have to regret that, while they have been longer than was intended, many things that I wished to include have been omitted for the want of time and space. The experimental work has been carried on while attending to a fairly busy practice, and has been taxing in the extreme upon both time and energy. Many experimental examinations have been omitted, the results of which would be interesting and profitable. It is hoped that these studies may be continued and extended by others in the near future, and not cease until we shall have an intimate acquaintance with the physical properties of all of the materials which we employ.

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# FURTHER NOTES ON HYDROGEN DIOXID.

BY HENRY LEFFMANN, M.D., D.D.S., PHILADELPHIA, PA.,

PROFESSOR OF CHEMISTRY AND METALLURGY IN THE PENNSYLVANIA COLLEGE OF DENTAL SURGERY.

ALTHOUGH considerable literature relating to the commercial forms of hydrogen dioxid has lately appeared, the topic seems to still afford an opportunity for discussion. The analytic reports as published in medical and dental journals show that although benefit has resulted from free criticism of the quality of standard preparations, much inferior material is still on the market. A wide publicity has been given to the names of those manufacturers who are furnishing a good article, and there is no longer any excuse for the use of an inferior one. There is no need of further comparative analytic studies of all the commercial forms, and attention may be given to determining what constitutes a good quality of hydrogen dioxid.

To assign a standard for an article intended to be used in the practice of medicine or dentistry is not always easy. Certainly, no merely arbitrary statement from a laboratory point of view can be accepted. In general, the Pharmacopœia must be taken, since that will be most likely to represent the sentiment of both physicians and pharmacists.

The U. S. Pharmacopœia has fixed a strength of ten volumes, determined in a prescribed manner, and I see no reason for departing from this suggestion. It has lately been asserted that the preparation should be not less than fifteen volumes, but the statement was made merely dogmatically, and we are left to wonder as to what process of reasoning led to the opinion.

In fact, when we come to consider this matter carefully, we see that, as in many other cases, we want not so much a special percentage of active material, but uniformity, purity, and, in view of the properties of this preparation, permanency.

It will be no advantage to the practitioner if a given brand is very rich in hydrogen dioxid and is, at the same time, irregular in strength, or more impure and less permanent than others somewhat weaker. Moreover, since the Pharmacopœia sets the pace even for many who are but little familiar with its pages, it will be well for manufacturers to keep to its requirements unless some well-founded objection to its standard has been set up. A departure from the requirements of the Pharmacopœia may be made by increasing the strength of a preparation as well as by diminishing it, and although the former offense is, perhaps, more likely to be condoned, it is none the less a breach of the rule and should be discouraged; indeed, in many cases, an increase in strength may be more serious than a diminution.

With these principles in view, I have subjected to examination some specimens of hydrogen dioxid, selecting only those that previous analyses had shown to be of fair quality. I thought it advisable to examine samples from widely different markets, and obtained them from New York, Chicago, and St. Louis, as well as from Philadelphia. They were all obtained through a retail druggist, and delivered to me in the original unbroken packages. I made, promptly after their receipt, a determination of the volume of available oxygen, using the permanganate method. The accuracy of this method has been shown by several observers. Messrs. Talbot and Moody (*Jour. Anal. and App. Chem.*, November, 1892) show that a solution, which by direct gas measurement evolved 10.22 volumes, gave with the permanganate method 10.08, a difference of 0.14, too small to be of significance in commercial analyses.

| Brand. | Volumes of Oxygen. | | | Acidity |
|---|---|---|---|---|
| | March 8. | April 8. | July 11. | U. S. P. |
| 1. McKesson & Robbins, Philadelphia | 10.17 | 10.01 | 9.7 | 2.7 |
| 2. " " New York | 9.6 | 9.1 | 9.3 | 2.7 |
| 3. " " Chicago | 9.6 | 8.9 | 9.3 | 2.8 |
| 4. " " St. Louis | 9.7 | 9.1 | 9.3 | 2.5 |
| 5. O. C., Philadelphia | 9.9 | 10.01 | 9.5 | 5.5 |
| 6. " New York | 9.9 | 9.7 | 8.0 | 5.9 |
| 7. " Chicago | 9.6 | 9.0 | 8.5 | 4.1 |
| 8. " St. Louis | 9.6 | 8.9 | 7.4 | 3.5 |
| 9. Marchand, Philadelphia | 12.0 | 11.2 | 9.8 | 7.3 |
| 10. " New York | 13.7 | 13.7 | 12.7 | 16.0 |
| 11. " Chicago | 13.5 | 12.4 | 8.5 | 5.5 |
| 12. " St. Louis | 14.2 | 12.7 | 11.1 | 6.5 |
| 13. Larkin & Sheffer, Chicago | 8.1 | 8.0 | 6.6 | 2.7 |
| 14. " " St. Louis | 8.8 | 8.9 | 7.4 | 1.5 |
| 15. Squibb, New York | 14.3 | 7.9 | | 53.0 |
| 16. J. Robbins, London, Eng. | 4.9 | 4.7 | | 48.5 |

It is necessary to say something as to the apparent fluctuations in strength, some samples appearing to get stronger and then weaker, or the reverse. These variations are slight and infrequent. The explanation is to be found in the fact, first, that the analytic process, though sufficient for control of commercial samples, is not absolutely accurate and is, doubtless, subject to slight variation by temperature and even by the manner in which the permanganate is added, that is, whether rapidly or slowly. The quantity of the material taken is 1 c. c., and it is not easy to measure this each time with absolute uniformity, so that a little more liquid may be delivered at one time than at another. The variations occur with the McKesson & Robbins samples, and amount to only 0.4 volume in the extreme case. It is possible that the low figure noted for No. 3, on April 8, was the result of some error of observation, but as the calculations were not made until all the figures for that date were obtained, it was too late to determine the point. It is worth while noting that No. 10, which has the highest observed acidity of its series (the numbers representing the relative volumes of sodium hydroxid solution required to neutralize 50 c. c. of the sample), keeps the best. From April 8 to July 11 the entire series of samples were kept in a photographic dark room, located so that the walls are partly exposed to the sun. When the specimens were examined a day or two before testing them, it was found that the corks of Nos. 9, 10, 11, and 12 had been blown out. No pressure was exhibited by the other samples, except a slight one by No. 14.

A sample of McKesson & Robbins's preparation, which had been kept on hand (in photographic dark room), unopened, for ten months, was tested and found to contain 8.9 volumes, the original strength of similar samples being ten volumes. A sample of Larkin & Sheffer's manufacture, which had been on hand for some weeks after having been opened and had stood in the laboratory, showed 8.1 volumes.

The above data show that two brands are closely in accord with the requirements of the Pharmacopœia in regard to strength and acidity, are uniform in quality, and keep well. I can see no advantage in exceeding the proportion of ten volumes of oxygen unless a much higher figure is to be secured for special work, as is done with the ethereal solutions now sold. The commercial samples of hydrogen dioxid, prepared for medicinal use, are not as a rule fitted for employment in the more exact departments of analytic chemistry. Concerning the medicinal aqueous solutions of strength above twelve volumes, I deem it proper to say that two cases of serious explosion have been reported to me verbally; in one of these a well-known surgeon narrowly escaped the loss of his sight, and in the other a sample bottle exploded, shortly after an agent of the manufacturer had left it on the table in a doctor's office. I have scarcely ever opened these strong solutions without getting evidence of high internal pressure. On the other hand the brand designated by Nos. 5 to 8, inclusive, rarely gives any evidence of pressure, and the brand designated by 1 to 4, inclusive, shows no pressure at all.

# PROCEEDINGS OF SOCIETIES

## DENTAL SOCIETY OF THE STATE OF NEW YORK.

(Continued from page 693.)

A SYMPOSIUM on the subject of "Green-stain" was held, in which three aspects of the topic were presented, as follows:

### THE ETIOLOGY OF GREEN-STAIN.

Dr. CARL THEODOR GRAMM, Chicago, Ill.

As concerns the prognosis of green-stain, there has been much difference of opinion among various writers.

Fox and Harris ("Diseases of the Human Teeth," 1855) promulgate that green-stain is very injurious in its effects upon the teeth, "as it corrodes the enamel and disposes the teeth to become carious."

Leber and Rottenstein, in a treatise on "Caries of the Teeth," 1867, find it "principally in young individuals on the front teeth and usually ascribed to a decomposition of the enamel-cuticle. . . . The process does not confine itself to the surface of the tooth, but penetrates into the substance of the enamel."

Wedl ("Pathology of the Teeth," 1870): "The discolored portions present spots where the tinge is more or less intensified. The latter usually are more evident in the *depressions produced by erosion of the teeth*. . . . I have never observed a penetration of the green granular mass into the peripheral enamel-layer, though I have met with systems of enamel-prisms containing deposit of pigment which have acquired a green color in their corticle-layer ; a condition which may be explained by the penetration of coloring-matter."

I quote from "Taft's Operative Dentistry," 1877 : "Wherever present the surfaces of the teeth are abraded, and when it is of long standing the entire enamel beneath it is destroyed and the dentine gradually involved in the dissolution."

Tomes ("Dental Surgery," 1873) thinks the color to be "perhaps of vegetable origin, and probably occupying the substance of the enamel-cuticle." He adds, "Most writers have found it to be perfectly innocuous."

Professor Miller, in "The Deposits upon the Teeth" (DENTAL COSMOS, 1894), quotes, in addition to the above, Robinson ("The Surgical, Mechanical, and Medical Treatment of the Teeth," 1848), who deemed the action of green-stain "sour" in character and very pernicious, entirely "denuding the teeth, destroying the crystalline appearance of the enamel, whereby the underlying dentine became carious."

I am indebted to the same writer for the following statement of Schlencker ("Illustrite Zahn und Mund Pflege," 1884) : He considers "green-stain exceedingly dangerous to the teeth because the enamel is broken down by it."

Baume ("Zahnheilkunde," 1885) finds "the enamel-cuticle *permeated* by a granular greenish substance, which is attributed to an accumulation of leptothrix. . . . But the rough surface which is often found under green-stain proves that, nevertheless, a very superficial decomposition of the enamel takes place. . . . The green-stain may therefore, to a certain extent, be regarded as predisposing to caries."

And Brandt ("Zahnheilkunde," 1890) finds it "evident that the process is by no means restricted to the surface of the teeth alone, but in part also penetrates the upper layer of the enamel. . . . On application of mineral acids the green-stain immediately disappears."

Baštyr (Scheff's "Handbuch der Zahnheilkunde," 1892) supports Nessel's view that the stain has no injurious effect upon the teeth.

Latterly Ottolengui (DENTAL COSMOS, 1892) considered the formation of green-stain due chiefly to the fermentation of the residuum from the milk which adheres to the enamel and invariably causing erosion.

Professor Miller (DENTAL COSMOS, 1894), in the article before referred to, takes up the question and disposes of it as follows : "It always remains restricted to the enamel-cuticle, and does not encroach upon the enamel ; every trace of the stain peeling off along with the enamel-cuticle when the tooth is acted upon by acids. Pits, fissures, grooves, or scratches on the surface of the tooth predispose to the deposition of green-stain ; likewise a surface roughened by the action of acids. This has led some to suppose that the stain was the cause of the roughness, while as a matter of fact the sequence has been just the opposite."

Following this conclusion of Professor Miller's, your correspondent, Dr. Ottolengui, again takes up the subject (DENTAL COSMOS, 1894) in his very interesting report to your society, May of last year, the notes and discussions of which are fresh in your minds.

In his query upon the subject of green-stain, sent to gentlemen of national reputation, eight communications reached him, three of which, Drs. Andrews, Black, and Kirk, supported Professor Miller's opinion, while five, Drs. Hart, French, Jarvie, Allan, and Professor James Truman, were opposed to him.

It would seem a fairly hopeless task for one with limited time to endeavor to fully trace or to put upon a scientific basis the etiology of green-stain when so many earnest and capable investigators on cis- and trans-Atlantic ground have essayed the same labor and made but small advance. I have worked without prejudice, and diligently, on the topic assigned me by your committee ; and what I have to offer on green-stain, whether it be in corroboration or rebuttal of recent writings on the subject, has been achieved by independent investigation, and may, therefore, have more weight with my *confrères*. I may state here, parenthetically, that to afford sufficient basis for the work I have utilized the material of a large orphan asylum, various dispensaries, several institutions of Chicago, where hundreds of teeth are extracted daily ; my own oral clinics and private practice ; have examined fully three hundred cases of green-stain within the mouth, and have selected cases from not less than fifteen thousand of extracted teeth.

No special class of patients or of teeth is exempt from green-stain, but it is most frequently found on pitted, grooved, or markedly striated enamel-walls of incisors and cuspids and in unclean mouths.

As a rule, I have found erosion underneath green-stain associated with (1) exanthematous impress upon the teeth ; (2) with a measure of constitutional degeneracy, congenital or post-natal, affecting the nutrition of the tooth itself and the fluids of the oral cavity.

Since, however, these are precisely the circumstances under which erosion *without* green-stain is found, it cannot be held that green-stain *per se* is responsible for the erosion in such cases.

Among eighty-five adult Russian Jews, in many of whom degeneration was marked, I found fifty-seven cases of green-stain. Of these, three cases showed erosion associated with the discoloration. There were, however, eleven cases of typical erosion without any stain whatever. In fifty-four of these cases of green-stain the discoloration was readily removed with $H_2O_2$, and the enamel-wall, after probably years of discoloration, left perfectly polished and translucent.

Out of 1200 stained permanent largely carious teeth which I found in the various "dental parlors" of this city, less than three per cent. showed erosion of the enamel ; this too, in face of the fact that the patrons of those institutions are not especially given to the care of their mouths, and a goodly proportion of them are poorly nourished.

At Dr. Rosa Engelmann's large children's clinic at the United Hebrew Charities Dispensary, which I had the privilege of attending twice weekly and at which I made notes of over eighty cases of green-stain, the percentage of decalcification was unexpectedly small. I found but six cases suggesting erosion, and these were notably among children of rickety, tuberculous, and neurotic diathesis. This in face of the observation of Professor Truman, "In young persons it has invariably been shown to be accompanied by decalcification."

*Recurrence of Green-Stain.*—Dr. Ottolengui has sought to find a point in favor of his hypothesis, namely, that fermentation of the residuum of milk caused the stain, by calling attention to the non-recurrence of green-stain after having once polished it away and reduced the imbibition of milk.

I doubt, in the first place, whether the partaking of any one kind of food has aught to do with the product under discussion. My own clinical records, at least, do not suggest it.

The cause of non-recurrence lies more probably in the polishing away of the cuticle, to which alone green-stain takes kindly.

In October, 1894, I, in several instances, polished the middle one of three stained oral teeth, leaving the other two or more untouched. Having recently seen the cases, I found no recurrence of the stain, proving that either the general conditions under which green-stain was originally produced had changed, or that the tooth had been rendered uninviting by removing the cuticle.

*Green-Stain under the Microscope.*—For microscopic examination of green-stain, I have used ground sections of enamel and the separated enamel-cuticle. I prefer the ground sections because of the greater accuracy with which the distribution of the stain may be studied. The pits, depressions, and grooves affording the greatest shelter are usually the first and last to harbor green-stain.

The granular elements associated with the stain seem, at times in its incipiency, to be colonized upon individual enamel-prisms, leaving a clear peripheral margin. Again, too, I have seen them arrayed at the periphery, leaving the central field of the prism clear, or, at most, tinged pale green, owing to diffusion. In the denser accumulations, all traces of prism-arrangement may be lost and simply large, finely granular patches, with occasional larger granules of deeper tinge, show in the field. As far as I could judge by my incompleted experiments, they absorb the anilin dyes eagerly and lose them as readily.

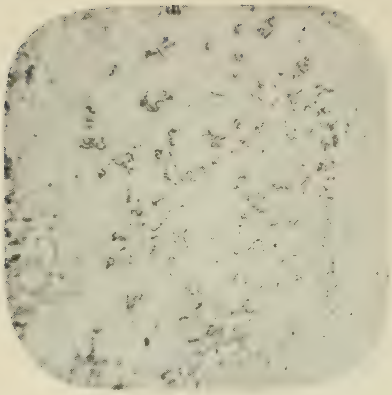
I think that all microscopists will support Professor Miller, in that "algæ do not grow upon the teeth." The point of solubility of chlorophyll in ether and in the insolubility of green-stain in alcohol, ether, and chloroform is well taken by that author.

Of the hundreds of examinations that I have made, none have pointed to the presence of algæ.

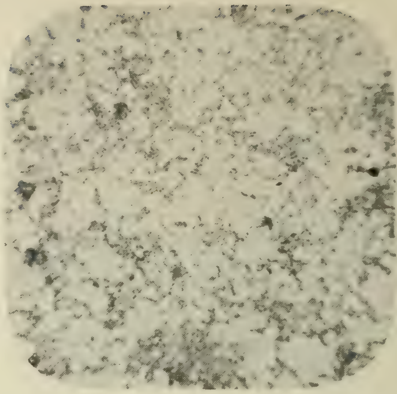
*Cause of Green-Stain.*—In Professor Miller's "The Deposits upon the Teeth," the proposition that the stain may be due to sulfomethæmoglobin, each argument for that proposition is negatived so potently by Professor Miller himself that it seems hardly a matter for further consideration.

My clinical experience and that in the biological laboratory leads me to support the proposition that green-stain is a chromogenic phenomenon attending, under certain conditions, some form of bacterial life within the mouth.

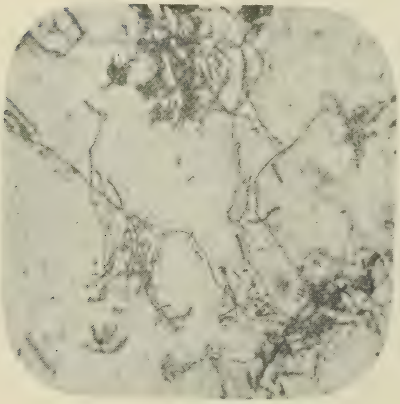
Carl Fraenkel ("Grundriss der Bacterien Kunde," 1890), dealing



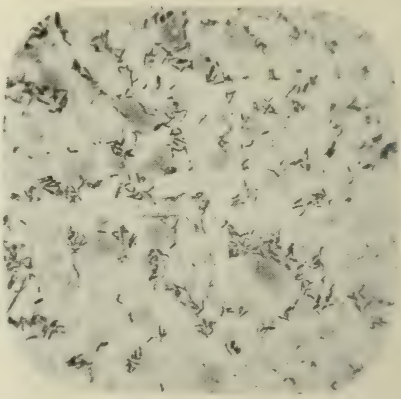
Green-stain, sedimentary culture. Streptococci in S. S. P. bouillon.



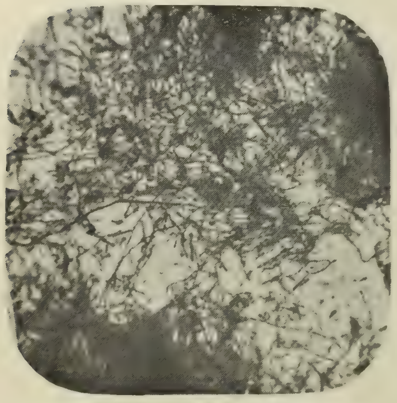
Mouth-bacteria. Green-stain, on agar. Streptococci.



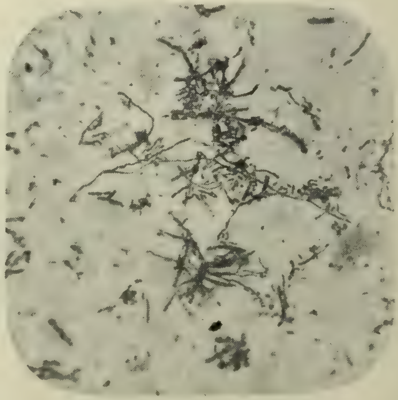
From tooth in S. S. P. bouillon. Various rod and cocci forms.



Decalcification bacteria. At cervical margin.



From tooth in S. S. P. bouillon. Leptothrix.



From tooth in S. S. P. bouillon. Spirillæ, etc.

with chromogenic species, writes, "All kinds of colors may be observed, white, black, blue, green, brown, red, orange, etc., some of them the brightest hue. How the formation of coloring matter is accomplished is not yet known with certainty. Probably the majority of micro-organisms do not generate the pigments directly, but only the basis of it,—a chromogenic body. If this is liberated in any way, for instance, by its passing through the membrane of the cell by diffusion or by death and decomposition of the micro-organisms, it has an opportunity to combine with certain ingredients of the culture-medium, or to gain access to the oxygen of the air, and then, but not till then, does the color appear. This explains why the pigment is often observed only on a surface of our cultures, and why the tint is, as a rule, dependent upon the nature of the substratum."

The only instance in which I was able to produce green-stain upon a sterilized tooth which had shown no trace of it before the experiment was by associating it with a stained tooth in a tube with saliva and sugar. The green-stain, though very slight, accumulated at the line of the gingival margin on the enamel, which had suffered some slight decalcification before an injury while being extracted.

My attempts to artificially produce the stain on culture-media have so far been unsuccessful. Morphologically, all the varied stages of the growth, if we accept the pleomorphic theory, and the various species of bacteria which I found in scrapings of green-stain, were represented in my cultures. Not, however, until I resorted to the peptone-sugar-starch bouillon with a sterilized tooth suspended in it, and here I made an interesting observation. Within forty-eight hours a pure rich development of streptococci, which sank to the bottom, appeared in the liquid, which had become acid. The enamel-walls of the four teeth which had been suspended in the flasks were laden with heavy growths of Miller's Leptothrix innominata, Bacillus buccalis maximus, Leptothrix buccalis maxima, Jodococcus vaginatus, of the cultivation of which Miller ("Micro-organisms of the Human Mouth," 1890, page 69) says, "They all have the peculiarity that they will not grow on any of the usual culture-media. All endeavors at cultivation—and thousands have been made—proved unsuccessful. I have myself made hundreds of attempts to cultivate them on all of the various solid and fluid media. . . . I find it, however, more reasonable to explain the failure on the simple ground that these bacteria are very sensible to slight changes in the culture-media, and that no one has yet succeeded in constructing an artificial medium sufficiently similar to that found in certain mouths to admit of their cultivation."

The deposit on these teeth resembles the common *materia alba* in color and consistency, while the enamel, due undoubtedly to the acid condition of the bouillon, suffered a superficial decalcification and became of brownish color, very like that often seen in incipient decay on the approximal walls of teeth.

I repeated the experiment with bones of varied densities and with c. p. phosphate of lime in simple bouillon. The broth became putrid and the bacteria assumed a different character in each of the flasks, though inoculated from the same tooth and the same scraping; while the deposit of one flask was granular, that of another was thready and slimy, while that of still another had a tendency to accumulate in cheesy balls. I mention these tests to indicate how varied conditions, however slight, may influence morphology, character, and life of most bacteria.

The tendency of the self-same bacteria to favor either fermentation or putrefaction is largely influenced by associated conditions, as is witnessed every day in the laboratory.

Considering the great number of bacteria in the mouth, representing various species and stages of development or degeneration, it becomes clear that the labor of isolating, cultivating, and classifying them multiplies in geometric progression. I personally feel that my several years of continuous labor have brought me simply to the threshold of the science of biology.

To summarize, then, clinically, green-stain may be considered innocuous.

It most frequently exists without causing erosion, if there be no congenital impress or post-natal constitutional degeneracy.

It may be considered a chromogenic phenomenon, since we know chromogenic bacteria exist in the mouth, and it is reasonable to suppose that green-stain should become diffused throughout the enamel-cuticle, where, in grooves and pits, it may find shelter for itself and its producers.

## The Classification of So-called Green-Stain.

W. C. Barrett, M.D., D.D.S., Buffalo, N. Y.

Probably fifty per cent. of the teeth that fall under the observation of the dentist are affected by some form of pigmentation. Dentists have speculated upon it ever since there was a dental profession ; but until the time of Miller there never was, so far as I know, any such series of scientifically conducted experiments to positively determine its nature and character as could be accepted as definite. I cannot but believe that he has permanently settled the question of the etiology of this appearance, in the memorable article appearing in the Dental Cosmos for April, 1894. If he is right, that determines its classification. After the president of this society had refused to accept my declination of the honor which he tendered me nearly a year ago,—that of preparing this paper,—it was my good fortune to have Professor Miller as my guest for some days, and we went over this whole subject together. I was then, as now, convinced that those who have criticised his article as inconclusive either had not read it carefully or had not comprehended it fully. It was inconclusive in so far as it failed to support the crude theories previously advanced, but it was conclusive in establishing the fact that the so-called green-stain is usually a superficial deposit, and that it probably has no special pathological signification, except for diagnostic purposes.

When Dr. Miller was at my house, he had with him a large number of teeth exhibiting the stain, some of it green, some brown, some red, with the varying intermediate shades. There were the teeth of children, and of adults at different ages. There were a few cases in which, beneath the stain, was found eroded enamel, and there were many instances in which no sign of decalcification existed under it. There was indisputable stain upon decayed tissue, and it dropped into and followed the depressions of furrowed enamel; but in no instance, so far as I could observe, did it appear other than as a distinctly superficial deposit. We removed the enamel-cuticle, or Nasmyth's membrane, from teeth upon which there was a marked pigmentary deposit, and in every instance the stain came with it, leaving the tissue beneath it clear, white, and unmarked. This was the case in instances of furrowed enamel, in teeth with eroded enamel, and in those in which the enamel seemed comparatively perfect. Let me say, however, that teeth whose enamel is uneroded, smooth, and polished are less frequently affected by stain, for the same reason that salivary and other deposits are not likely to be found on polished surfaces. It requires depressions, either minute or more defined, to afford lodging-places for the initial deposits, and hence eroded enamel is more predisposed to pigmentation than that which is perfect.

For purposes of classification, I shall make no distinction between the green, the blue, the black, the brown, or the red stain, or their intermediate shades. Clinically they are the same, and they have the same generic origin. If they are metallic in their source, the color depends upon the metal whose compounds form the stain. If they are due to bacteria, it depends upon the nature of the chromogenic organisms. Hence, no distinction will be made, except as indicating the origin of the discoloration.

*Mineral Sources.*—As one important factor, I will mention the metallic deposits that we frequently find upon the teeth—usually the incisors—of workers in copper, bronze, brass, iron, mercury, lead, nickel, and silver. This has all been pointed out by the authority that I have mentioned, and he also refers to the fact that trumpeters often show a discoloration brought about by the contact of the teeth with the brass mouth-piece of their instrument. The teeth of tailors, also, are often discolored by the coloring-matter of the cloth in which they work. Among one hundred and fifty persons, workers in brass, bronze, and copper for more than one year, whom Miller examined, he did not find a single individual who did not show more or less of green-stain upon the upper teeth, and this in varying shades. I may say that I have myself examined about fifty such, with nearly the same result, the only exceptions being in persons who were fastidious in the care of their mouth, or whose teeth were incrusted in other deposits.

There are many animals whose teeth are covered by shining metallic deposits. These are chiefly or wholly among the graminivora. In some species the teeth of nearly every individual appear as if freshly gilded. In others they are quite black. Miller says he has found manganese deposits upon the teeth of the elephant, rhinoceros, dromedary, elk, deer, and cow. We all know that superficial discoloration is frequently found at the margins of amalgam fillings, and workers in mercury are liable to special deposits upon the teeth. The very hair of copper-workers becomes discolored, and their teeth form no exception.

*Fermentation of Organic Matter.*—The white, cheesy deposit that is found about the necks of teeth, especially such as suffer from neglect, is apt in the course of the fermentation which it undergoes to become discolored, or, rather, to leave about the necks of the teeth a pigmentary deposit. This may arise from the mixture with it of mineral substances which are finally precipitated, or it may be the result of the chemical changes through which the matter passes. This cheesy deposit may have either an acid or an alkaline reaction, according to the character of the fermentation which is going on. If it be acid, the erosion of the teeth beneath it may be easily comprehended. We have but to reflect that the surface of the cervical portions of the tooth being thus superficially decalcified, if the character of the fermentation should change, and mineral or other pigmentary matter become a constituent of the deposit, it may be precipitated upon the eroded surface of the tooth, and thus give origin to a distinct stain.

*Chromogenic Bacteria.*—It is well known to all observers that certain forms of micro-organisms produce a distinct coloring-matter. Many of the macroscopic fungi do this, and we find the most brilliant colors in the mushrooms, molds, etc. Deposits about the teeth may become infected with these chromogenic or color-producing bacteria, and thus the tissue will be stained yellow, red, or some other color.

*Sanguinary Deposits.*—I believe it to be the case that in some instances the discoloration of the teeth is due to deposits from the blood. Miller says that if in the presence of air or oxygen a current of sulfuretted hydrogen is brought in contact with fresh blood, sulfomethæmoglobin will be formed, which is greenish-red in concentrated and green in dilute solutions. It is not probable that this will be a very important factor in the production of these colored deposits, yet it will account for some instances.

*Foreign Organic Matter.*—We all know that the teeth of tobacco-users become deeply dyed in some instances. This is not usually confined to any special locality, but if when applied, as it usually is, alike to all portions of the tooth it stains, one may readily comprehend that other substances may be introduced into the mouth whose action will, because of limiting circumstances, or through non-liability of some of the tissues to their effects, cause a pigmentary deposit.

*The Green-Stain of Childhood.*—Thus far we have considered only the discoloration that may be found on the teeth of adults. It is evident that the same rules as to classification cannot obtain in the case of children. We must eliminate the metallic causes and search for other origins. Sufficient still remains in the action of ferments. There is not the same diversity in the color of the pigments, and this leads to the conclusion that there are fewer causes to classify. At first thought, we might imagine that the enamel-cuticle plays an important part in the green-stain of childhood, but it has been shown that it has appeared upon the surface of phosphate fillings in the deciduous teeth. That it may be changed by the application of bleaching-agents like peroxid of hydrogen, would indicate that it is of organic origin, although it does not positively demonstrate it. There is a constant decomposition of food about the teeth, and bacteria are especially active in the oral cavities of children. The secretions of the mucous glands, that are somewhat specialized at the gum-margins, are frequently degenerated, and, under the action of ferment organisms, decomposed, and this may cause a pigmentary deposit, which will naturally follow the festoon of the gums and give the crescentic appearance which the green-stain of childhood usually presents. It follows, then, that this form of discoloration should probably be classed with those which are of fermentive or bacterial origin.

*Conclusions.*—The chief point of interest to us, as dentists, arises from the question as to whether these stains are an etiological factor in pathological conditions. I am well aware that this properly forms no part of the task assigned me, but it is impossible to range the different forms of discoloration into classes without reference to their origin. The part assigned me is utterly barren, if the pathological significance of the deposits cannot be adverted to. From what I have already said, it may be gathered that I have little faith in the pathological significance of green-stain, and that I hold the belief that we, as practitioners, need not trouble our heads about it, except to remove it by mechanical means. The erosion that is often found beneath it must have preceded its deposit, for it invariably ceases when there is a complete coating over the eroded places. It never penetrates beneath the enamel-cuticle when that exists upon the tooth. It may be dissolved by chemical agents, and the most careful chemical analysis shows nothing in it that would be injurious. While it may be infected by bacteria, and while the stain may be the effects of micro-organisms, it cannot be shown to entirely consist of those organisms. Heide and Charpentier believed it to consist of leptothrix threads, but later observations show that this was a manifest error.

I cannot conceive of any further classification of the stains of the teeth than through the sources of the pigmentation, and these are so widely variant that, practically, they are numberless. I have enumerated some of the more prominent ones, and leave the subject with you in the hope that further information may be elicited in the discussion of the subject.

## THERAPEUTICS OF GREEN-STAIN.

S. B. PALMER, M.D.S., Syracuse, N. Y.

The above subject, as submitted by your committee, is divided as follows:

A. Agents facilitating the removal of the stain.

B. Agents acting preventively.

C. The proportion of recurrences of the stain, and of decalcification around fillings inserted, and whether one filling-material acts more beneficially than others.

With all that has been written upon the subject of green-stain, there seems to be no settled belief. Therefore, the writer will not add to the length of this paper by quotations from books or authority, but give a brief summary of his own observations from practice.

A. All who have removed this pigment know that it is far more difficult than it would be to dislodge ordinary tartar of the same thickness, especially when the enamel-surfaces are roughened, containing pits and fissures. One most effective and convenient agent to use is a detersive powder, of which there are several: fine pumice, powdered Arkansas stone, flour of emery, Tripoli powder, etc., moistened and used on strips, wooden points, and with brushes. The engine, with its ready appliances of small brushes, wheels of moose-hide, rubber cups, wooden points, disks, etc., will reach nearly every surface and perform the work rapidly. Probably the most practical and universal of the powders is fine pumice. A good wheel for flat surfaces is moose-hide. Rubber cups reach many difficult places, and are effective because they carry the powder much longer. Narrow polishing strips, with thin cloth backs, cut to a point at one end, passed between the teeth near the gums, charged with powder, are good for approximal surfaces. In cases of uneven surfaces of enamel, coarse pumice can be used to good advantage, as it will enter deeper into pits and depressions. Still, with all the above-named appliances, the stain cannot be readily removed from inaccessible surfaces. After experimenting with many agents, I have adopted pyrozone, three per cent., with which to moisten the powder, and, in extreme cases, add one or two drops of phosphoric acid, used for cement fillings, to a teaspoonful of moistened pumice. A tumbler of warm water, containing a little carbonate of soda, is good for rinsing the mouth.

As a bleachant from within the tooth, pyrozone seems to be the only thing now known to the profession that will restore, with any show of permanency, a pulpless and, therefore (*therefore* in a majority of cases), discolored tooth to a shade approaching that of its ante-pulpless days. This property of pyrozone has been taken advantage of pretty generally, and discussed to that extent that nearly, if not quite everything, claimed for it is conceded.

As a decolorizer from without, less is known and, as a consequence, less is said of it. The removal of stains (green or other) mechanically involves or necessitates the loss of more or less of the tooth, robs the superficial portion of its fine structure and luster, and prepares the way for a speedy return of a deeper dye, with repetitions of the process of removal until the child has outgrown the conditions of which green-stain is simply an indication, and of no more consequence *in itself* than red stain or blue. To avoid this mechanical mutilation, which is urged chiefly because of the offensiveness of the stain to the eye, two, of what appear to be purely chemical processes, have been resorted to :

1. The application to the stained surface of iodin, followed by weak aqua ammonia (or aromatic spirits), repeating the applications at the same or a subsequent sitting until the stain disappears.

2. Removal of oily deposits from the teeth by the application on cotton of ammonia or bicarbonate of soda, followed by clear water, and this by twenty-five per cent. pyrozone, well rubbed in with cotton or a leather buff, followed in turn by soda, to neutralize the slight acidity and mitigate the occasionally caustic effects on the softer tissues. This latter treatment is effective to a remarkable degree, usually accomplishing its purpose promptly and always without injury to the teeth, either as to structure or luster, which we have demonstrated repeatedly as well out of the mouth by immersing teeth in caustic pyrozone for periods of two weeks at a time.

In case the enamel is roughened and dissolved nearly through to the dentine, a stone wheel, fine grit and broad face, will give a better surface by grinding the prominent portions down, which will lessen the depression. In the event of sensitiveness, it is better to make two or more operations, leaving the surface polished each time. To reach deep pits, the small brushes used with the engine do nice work ; by cutting them back one-half the length and to a point, they are better than wooden points to hold the powder.

B. Agents acting preventively. Leaving out the *primary cause*, prevention consists in so changing the conditions as to prevent secondary deposits. The two most prominent conditions favoring green-stain are roughness of enamel and uncleanliness, or neglect to remove that which ultimately produces it. After a case has been treated as above mentioned, with ordinary care in brushing, and the use of a dentifrice, there is seldom any recurrence.. With the habit of neglect which allows the deposit, one lesson in prevention will not always be sufficient, although the patient may think the instructions have been followed. It is much like removal of tartar : by care, it can be prevented from any considerable lodgment ; by neglect, it accumulates. Usually, when a patient calls for a removal of the pigment, both density of the enamel and understanding how to prevent a recurrence are greatly in favor of success.

C. The proportion of the recurrences of the stain and of decalcification around fillings, and whether one filling-material acts more beneficially than others.

The proportion of recurrence is determined by the attention given to instructions. With young children and no one to see that the teeth are cared for, we would look for a large percentage of recurrences. With proper care quite opposite results would follow.

*Decalcification around Fillings.*—I am not prepared to say that the color has anything to do with disintegration of the enamel. We find that condition both with and without the pigment. Usually both conditions are results of allowing food to remain confined by the lips to undergo fermentation with its attendant consequences.

So far as my practice is concerned, in either case gutta-percha is best for young teeth, even if renewal is necessary, until the dentine becomes dense. Gold may be safely used as inlays ; a thin plate of gold cut to fit the cavity, the under surface being raised to sharp points with a graver and set with cement, gives perfect satisfaction and is durable, while a gold filling would prove an injury. The most satisfactory fillings, when done, are porcelain inlays inserted in like manner.

The above conclusions are drawn from study in practice. One case in particular afforded several facts relating to specific conditions. A man, fifty-three years of age, whose teeth have been under my care for thirty-five years or more, called for work some eight months ago, and, to my surprise, presented the most pronounced green-stain I ever saw. The upper centrals had a thick deposit extending from the gums over one-half the length of the crowns ; color, dark green ; the laterals not coated so heavily and color lighter ; both color and deposits shaded down to second bicuspids. The thin deposits were a nice shade of green. The lower teeth had less deposit, and all upon the labial surfaces. I have no recollection of having to remove green-stain from the patient's teeth before. The removal was attended with great difficulty, showing it to be genuine. It also called for the agents mentioned in connection with the pumice-powder. The enamel had become roughened under the thick portion on the centrals, not so deep as to hinder an even surface and good polish. Before finishing this paper I wrote for the patient to call, which he did, and there is no evidence visible that green-stain ever troubled his teeth. The practical lessons drawn from this case are as follows:

Green-stain will appear upon the teeth of adults when the conditions are favorable.

This patient was on the road for a confectioner. He had not used a brush for a long time; said he had neglected his teeth, and would do better. In answer to the question, "Do you eat much candy?" said, "No; probably not much more than you do." He said, "This is the only kind I eat, and but little of that," and took from his pocket and gave me two pieces of molasses candy nicely done up in wax paper. It was a soft candy, and contained starch or glucose; it was not all sugar. To me it was evident that this candy was daily indulged in. Thus we have neglect and sweetmeats as a cause in this case. It showed that the deposit did roughen the enamel. The difficulty of removal showed a genuine case of green-stain. It proved that, with proper care with brush and powder, the pigment did not reappear. It also led to investigation as to the cause why the stain is less upon the lower teeth, and also why it is usually found upon the front teeth, growing thin back to the cuspids or bicuspids. The lower teeth presented an unusual amount upon the labial surface of the incisors and cuspids, though not as much as on the superior, and none upon lingual surfaces. The latter surfaces were covered with a soft, black tartar, colored with cigar-smoke. The tartar closed the spaces on the lingual side, which prevented the washing of saliva through the spaces to the labial surfaces. This suggested that saliva might be a preventive, or solvent of the pigment. Bearing this in mind, I have looked for indications of proof. We find little stain in connection with the saliva-ducts, and most frequently where the lip or lips prevent free circulation. In support of this theory a lady presented a well-cared-for set of teeth with no stain except upon the second and third lower molars. On either side the teeth leaned in, and were protected from the brush by the first molars and teeth forward. There was no appearance of stain upon the upper molars or the incisors, the mouth in general being well cared for.

By close observation I am convinced that, with saliva-ducts discharging freely under the lips, there would be little green-stain and still less erosion of enamel.

### *Discussion.*

Dr. M. L. Rhein. It is impossible to discuss the papers of Drs. Gramm and Barrett simply from hearing them yesterday. I had an opportunity of very hastily looking over Dr. Gramm's paper, but not sufficient time to enable me to speak of it in the way in which I would like. In fact, unless a copy of such papers as Dr. Barrett's and Gramm's is in the hands of a man some time before they are read, a proper discussion of the subject is impossible. A great deal of credit is due to Dr. Gramm for the magnificent original work which he exhibited to us last evening. It has undoubtedly helped to clear up a number of the etiological factors of this subject; and whether the classification is as clear as it ought to be at the present time is a matter that it is rather difficult to say. One practical view that seems to come out of the papers is the fact that erosion or decalcification does not follow from the stain, but is rather a prior condition to the stain itself. It would appear from clinical experiences that in all cases, as far as the destruction of tooth-substance is concerned, the stain itself is not an important feature. The view that the furrowed condition of the enamel leaves a lodging-place for stain to settle upon is, from clinical experience, the most satisfactory, just as the salivary deposits will occur on the roughened surfaces and not on the smooth enamel-surfaces. As far as the treatment of such cases goes, the absolute removal of these depressions and pits in the anterior teeth is necessary in order to put a stop to the depositing of these stains upon them. I have found in some cases, where the anterior teeth are very badly furrowed and where these stains abound, that you can get no satisfaction unless you take a stone and deliberately remove the furrows, and leave the surface as nearly as possible like the enamel state. In many mouths this can be done with impunity, if there is no acid condition. In my report yesterday I alluded partially to the treatment of erosion from a constitutional standpoint. Of course, I am speaking now strictly of erosion due to too much acidity in the secretions of the oral fluid. I repeat here what I said in my report yesterday, and would offer it for your consideration, that in a large number of cases you will find an excess of uric acid in patients who have this acid condition of the oral fluids. This seems to be due not to any uric-acid condition in the oral fluids ; I do not want to leave the impression that I believe the acid in the mouth is uric acid in a free state, and that is the agent which acts upon the teeth ; but, in all cases of excessive uric acid in the system we find a lessened degree of alkalinity in the blood, and it is this lessened degree of alkalinity in the blood which seems to prevent the remaining neutral or alkaline of the fluids.

Dr. Brubaker, of Philadelphia, has written exhaustively on this subject and given his views of how this acid exists in the mouth, but it is only a questionable hypothesis. I do not believe that the exact manner in which the mucous follicles give out this acid condition has been thoroughly settled. He did mention one point in his paper which may be of considerable value from a practical point. We have found in some of these cases that one, two, or three particular teeth are affected by erosion ; that is to say, it is limited to just those teeth, and he has made a recommendation that the destruction of the mucous follicles directly over those teeth should be attempted, in order to endeavor in that way to stop the secretion of the fluids directly over those eroded surfaces. I have not tried this treatment, but I think it is a method of treatment that is worthy of trial, and would bring it to the attention of any one who would like to make a trial of the treatment in cases where only one or two teeth are involved in erosion. There is just one other point in which I differ with the writer of the last paper, and that is, in the treatment of those cases where erosion has proceeded to a considerable extent, and we have the gutter-shaped cavities around the labial surfaces that necessitate some form of operative interference in order to put that tooth into a condition of comfort to the patient, and to prevent the destruction of the tissue toward the pulp. Dr. Palmer, in his paper, deprecated the filling of those cavities, except by gold or porcelain inlays. I believe that this is the poorest treatment they can receive.

There is a radical difference of opinion between Dr. Palmer and myself on this point. I think a filling inserted as well as it can be will preserve those cases. When I say a filling, I mean a gold or amalgam filling that is inserted properly. If a person does not feel like putting gold in these places, and if it is out of sight, amalgam can be inserted, if the excess of mercury is removed and sufficient free gold added to the amalgam so there will be as perfect conformity to the enamel as it is possible to obtain with gold. I believe such a filling is infinitely superior to oxyphosphate, a material which we all know is soluble in the fluids of the mouth.

Dr. R. H. HOFHEINZ. 'I believe that anything that comes from the pen of Professor Miller, of Berlin, ought to receive the most profound consideration from the profession, and the very fact that the New York State Society has chosen this topic as the only one for scientific discussion, and the fact that such excellent men as Drs. Gramm, Barrett, and Palmer have written on the subject, is sufficient evidence that Dr. Miller's work in that direction is bearing the proper fruit. When I had the pleasure of meeting him last year in Europe, he had completed all his researches in regard to green-stain. I have had the good fortune to receive a German edition of his work. Dr. Gramm will kindly pass it around, not for you to read, but to look at the plates, which I think are superior to the plates in the COSMOS. They were taken directly from nature, and are the truest examples of what Dr. Miller wishes to convey to us. I have not made any original researches in regard to green-stain, but have always been a follower of the theory of chromogenic bacteria, which I was glad to hear so ably brought out by Dr. Gramm. I did not understand Dr. Gramm to say whether he succeeded in producing cultures of bacteria from green-stain, which have continued to produce that green color. It requires a very fine discrimination between the bacteria that produce a stain and the bacteria that assume a stain from their natural surroundings. Professor Miller has succeeded in finding among the copper-stained teeth a number of bacteria which have been stained the same as the teeth, but have not retained the stain in their proliferation. He has succeeded in finding the bacteria in the green-stain of deciduous teeth, which he believes have reproduced the color. There is as much discrepancy about the result of green-stain as there is about its origin, namely, whether it produces a softening of the enamel-tissue or not. My individual opinion in that direction coincides with Dr. Gramm's, to say nothing of Professor Miller and the other gentlemen. I have removed a large amount of the membrane, which is easily done, and have found the enamel proper, after the cuticle had been removed, absolutely free from decalcification. I have with me three teeth which had green-stain upon them. I received them from one of my colleagues who does extracting and sends me teeth which I use for replantation. All three were stained considerably. I have not been able to get the history of the patient. I put the three teeth in a three per cent. solution of pyrozone for four weeks. They are perfectly white, and there is absolutely no softening of the enamel surface, excepting on *one*. In showing them to Dr. Gramm, he suggested that there was a laceration by the forceps on one of the two laterals. The cuspid is absolutely intact, as far as I can see. It is perfectly natural, particularly if this condition is owing to chromogenic bacteria, that they will always make their home in rough surfaces more readily than in smooth ones, the same as any other decay. In removing that stain, I have used pyrozone exclusively for the past six or eight months, and I have used as high as a twenty-five per cent. solution. I use such mechanical agents as may be required to give a smooth surface.

Dr. Gramm. As to removing green-stain, I want to ask Dr. Hofheinz whether twenty-five per cent. pyrozone, which is severely caustic, is not altogether injurious to the tissue of the gum?

Dr. Hofheinz. I isolate the tooth always.

Dr. Gramm. That, of course, makes a difference. I use three per cent. pyrozone or hydrozone with pumice-stone upon a rubber disk or polishing-cup. Green-stain may generally be easily removed with that means. In obstinate cases, instead of removing the cuticle with powdered pumice-stone, I would prefer to apply, for a few minutes, a ten per cent. solution of hydrochloric acid, which is but faintly acid, and remove the cuticle at once, green-stain and all. This to be followed with an alkaline wash, and a thorough polishing of the enamel with chalk.

Dr. Palmer. I want to speak for the purpose of harmonizing a seeming difference of opinion arising from discussing different conditions. When we treat scientific subjects we must go back to the first cause. There is not the variance which Dr. Rhein mentioned in the deprecation of gold; under certain conditions he would use gold. He is right; I would do the same. I was speaking of conditions which the paper would not allow me to describe,—that is, in teeth of soft structure that no one would think of filling with gold until the tooth became hardened. When we find a condition where we hardly know where to establish the cavity-margin or the line to fill against, then the dentine back of the gold is liable to be moist and decomposition the result; it is there that I spoke favorably of the gold inlay, lining with the phosphate, or gold with a lining of balsam. The part beneath the filling can be protected, and at the same time have the gold to protect the phosphate. I would recommend phosphate only to fill up the under side of the inlays of gold. It has remained under those fillings for years. When I speak of using gutta-percha and renewing it, it means on a certain class of teeth that I would not think best to fill with gold on account of the conductivity. The thermal changes of gold placed upon vital dentine so change the vital current that no further deposition of the lime-salts takes place to cover the pulp, consequently it is injurious. If we can use something which will not change Nature's current, the dentine will become dense in time; that overcomes the difficulty. He spoke of the advantages of amalgam. That would answer for buccal cavities, not for front teeth. I would not recommend it on account of the color. I do not use it as I did formerly. Still, the same principle is involved, I think, with improvement. If I were to use all gold or amalgam under the conditions mentioned, where the dentine would be too soft to exclude moisture, I would varnish with chloro-balsam; then you have something between the filling and the tissue that prevents chemical action, and you can use amalgam without having the metallic salts to discolor it. I use no copper in amalgam now. An amalgam filling can be made to appear bright and clear with a varnish lining. There is a chemical action set up between the particles of the mercury and the unamalgamated portions of the alloy, and the salts entering into the dentine filling the place which should have been filled with the lime-salts, which is a benefit, and the dentine is rendered negative to decay.

I would say that there are many points in the paper that could have been lengthened. It was intentionally short, giving you an opportunity to judge for yourselves and introduce here the points omitted. I hope I may have made myself clear in regard to the conditions which govern me in the use of gold. I use gold now where I did not a few years ago, and to better advantage, because I understand that the space between it and the bone had better be filled with something insoluble. Some who have disallowed the principle I have adopted, instead of using chloro-balsam, tin, or something of that kind, have recommended the melting in of paraffin. The principle is observed with beneficial results. I make no claims for any one thing, but only observe the principle to fill that space behind the filling in the dentine, which would be moist enough to entertain chemical action.

## AMERICAN DENTAL ASSOCIATION.

THE thirty-sixth annual meeting of the American Dental Association was held at the Auditorium, Asbury Park, N. J., commencing Tuesday, August 6, 1895.

The association was called to order at 11 o'clock A.M., by the president, Dr. J. Y. Crawford, of Nashville, Tenn.

After prayer by Dr. N. S. Hoff, of Ann Arbor, Mich., an address of welcome on behalf of the New Jersey State Dental Association was delivered by Dr. R. M. Sanger, of East Orange, and brief remarks were made by Dr. Lyman C. Bryan, of Basel, Switzerland, and Dr. L. L. Dunbar, of San Francisco.

On motion of Dr. T. W. Brophy, of Chicago, a cablegram greeting was directed to be forwarded to the American Dental Society of Europe.

The secretary, Dr. Geo. H. Cushing, of Chicago, read the resignations of Drs. A. W. McCandless, J. W. Palmer, and Dwight Smith, which on motion were accepted.

The secretary read a letter from Dr. H. E. Beach, of Brownsville, Tenn., president of the Southern Dental Association, inviting the American Dental Association as a body, and its members individually, to attend the next meeting of the Southern Association, to be held in Atlanta, the first Tuesday in November.

The PRESIDENT, calling the first vice-president, Dr. S. C. G. Watkins, of Montclair, N. J., to the chair, then read his annual address, of which an abstract follows:

After gracefully acknowledging the compliment paid him in electing him to the presidency of the association, Dr. Crawford recounted briefly the story of the Horace Wells memorial meeting held at Philadelphia, December 11, 1894, under the auspices of the association, and recommended that its proceedings be incorporated in the Transactions for this year. "The results of this meeting," he said, "go far to settle the question as to who was the real discoverer of the state known as anesthesia, not the discoverer of anesthetic agents."

In view of the fact that the Southern Dental Association has held no meeting since the appointment at the last session of this association of a committee to confer with that association regarding the feasibility of merging the two bodies, the address suggested that the committee be continued for another year. Earnest and united effort was urged in the matter of securing the representation of dental surgery in the medical corps of the army and navy, and the creation of a strong committee to investigate the propriety of some inquiry being made in regard to the condition of the mouth and teeth of an individual before obtaining life insurance. In addition to the advantages resulting to the life insurance companies, the moral reflex influence upon the whole community would be farther-reaching, perhaps, than almost any other pronouncement which this association could make at this time.

Referring to the effort being made in different sections by state and local societies to secure greater attention to the teeth of school children, Dr. Crawford reiterated his belief that a child should not be put to hard study until after the completion of the process of tooth-shedding and tooth-eruption. The premature nervous strain upon the child is much more destructive than has yet been conceived of. As another means of advancement in the practical application of dental science to the benefit of the masses, he requested the association to ask the medical colleges to institute *bona fide* chairs on dental and oral surgery, so that graduates in medicine should be required to know something of the diseases of the mouth and teeth, and of their deleterious influence upon the general health.

Passing to a discussion of the question of ethics, the president expressed his belief that the common disregard of proper ethical conduct in all lines—business and professional—is a serious menace to our welfare as a people. The only difference between commercial ethics and professional ethics is a supposed higher mental attainment of the one class over the other, and the interests involved ; hence the idea that professional men should be of the most exalted system of ethical conduct. Legal enactments have been suggested to put a stop to the nefarious practices of those who disregard the plain teachings of our written code, but these cannot be had until we have a better public sentiment upon the subject.

Dr. Crawford then inveighed against the too common practice of clergymen, newspaper men, prominent officials, presidents and professors of universities giving public indorsement to valueless, even hurtful patent humbugs as medicinal agents, a practice which he characterized as usurping the province of the doctor, the dentist, and the teacher of sanitation, and so a violation of ethics, resulting, through the improper application of remedies, in untold evil. Every infraction of ethical law results in injury to some one. If the dental surgeons of the United States, or even the better element, should unite in demanding the enactment of laws which would require of all men proposing to engage in practice the observance of proper ethical conduct, the quack and the mountebank would in time be annihilated. As an immediate remedy he suggested that every student should be required, before being permitted to enter college or receive the degree, to subscribe to an oath or obligation, which, while it would not entirely stop the evil, would deter many from wrong-doing; that the schools be required to do this before being eligible to membership in this body.

Dr. Crawford closed with a feeling reference to the death of Drs. J. J. R. Patrick and W. O. Kulp, both of whom had long been identified with the association.

The address was referred to a committee consisting of Drs. Wm. Crenshaw, A. H. Fuller, and Thos. Fillebrown. The report of the committee was presented at a later session and adopted, recommending the adoption of the suggestion of a monument to the memory of Horace Wells, and the incorporation of the addresses by Drs. Thos. Fillebrown and James E. Garretson at the Wells memorial meeting in the Transactions; the continuance of the committee to bring about a union of the Southern and American Dental Associations; a more persistent effort for the appointment of dentists to the army and navy; the appointment of a committee to report next year with reference to the bearing of the condition of the mouth and teeth on the obtaining of life insurance.

The committee regards the suggestion as to the education of children in the proper care of their teeth as of great interest and importance, and suggests further discussion upon it; recommends the adoption of the suggestion asking for the appointment of competent lecturers upon diseases of the teeth in medical colleges; considers the portion of the address touching upon professional ethics as furnishing food for serious reflection, and asks a discussion and expression of opinion upon it from this body.

A communication from the mayor of Asbury Park tendering the freedom of the borough was received, and a vote of thanks was returned.

Dr. THOMAS FILLEBROWN, Boston, offered the following, which was adopted:

> *Resolved*, That this association believes the conferring of honorary degrees in dentistry to be detrimental to the profession of dentistry, and hereby expresses its disapprobation of the practice.

Adjourned to 7.30 P.M.

### *Evening Session.*

The association was called to order at 7.45 P.M. Vice-President Watkins, in opening the session, announced the serious illness of President Crawford.

On motion of Dr. J. N. CROUSE, of Chicago, the reports of the committees on the history of the classification of dentists by the census bureau and the Horace Wells memorial, were made the special order for Wednesday afternoon at 3 o'clock.

The first of the two annual general addresses provided for by action taken at the last meeting, written by Dr. A. W. HARLAN, of Chicago, was then, in the absence of its author, read by title.

Dr. Harlan's address, which was entitled "Antiseptic Surgery," was devoted specially to the surgery of the dental pulp, the pericementum, and the alveolar process. The essayist quoted from Cheyne's "Antiseptic Surgery" as to the origin of fermentation, that the particles which cause it find their way to the point of infection directly from the air or from surrounding objects ; that so long as an animal is healthy, dead fluids or tissues may remain unfermented in closed cavities in the body, even entirely disappearing ; but that so soon as atmospheric air with its dust is admitted, organisms develop and fermentations occur. True antisepsis is always possible in the mouth, but asepsis is, in some cases, absolutely impossible. In the handling of the dental pulp, whether from the standpoint of its ultimate destruction or that of its possible salvation, the strictest antiseptic precautions are to be observed. All contaminating influences are to be excluded ; instruments sterilized by heat or the use of agents which will not fail to destroy all particles from the air or moisture with which they are brought in contact. The pulp, to be preserved, must be kept from contact with saliva or mixed fluids of the mouth ; water used upon its surface must be sterilized. Filtration is not sterilization. The water must be boiled, and all instruments cleaned and afterward boiled in a sodium bicarbonate solution, two to three per cent., or silico-fluorid, a saturated solution, 1–144. The pulp being in a closed cavity, after exposure, by disease or intentionally, is to be removed surgically, with all necessary precautions to insure freedom from infection of the pericementum at the apex of a root.

The address then quoted at considerable length from a paper on "Surgical Cleanliness," by Dr. Leonard Freeman, as a guide for purely surgical work in the mouth. In this paper the writer urges that "everything must be surgically clean, that is, as nearly as possible free from bacteria ; not only the instruments and dressings employed, but the hands of the surgeon and his assistants, and the skin of the patient to be operated upon. These things must be kept clean, and not be permitted to touch anything that is not as clean as themselves ;" and after giving an excellent and simple method of preparing, the writer goes on to say, with reference to cleansing instruments : "Simply immersing instruments in bichlorid or in carbolic acid is not effective. . . . The best method is to boil the instruments in a one per cent. solution of carbonate of sodium. The boiling, in spite of what has been said to the contrary, does not injure the edges of knives, especially if they have been wrapped in cotton. After boiling, there is no necessity for placing instruments in carbolic acid or any other solution—they are already sterile. . . . Five or ten minutes' boiling is enough—no pathogenic germ can live after that. It is not necessary to boil for half an hour or longer, as is often advised."

Dr. Harlan went on to say that neglect to use the proper and necessary precautions in removing the pulp, or in the subsequent cleansing of the canal, will lead to much suffering and frequently eventuate in the loss of one or more teeth, portions of the process, or even of the maxilla itself. All operations on the roots of teeth, under the gum and between the tooth-root and the alveolar process, will be more uniformly successful when they are made with surgically clean knives, burs, gouges, and scraping instruments. No syringe point should be introduced into the pericementum, or the gums, that is not surgically clean. Dirt, grease, dried blood, mucus, or any septic matter adhering to the needle will not be rendered aseptic by the soaking in any strength solution of a chemical disinfectant, unless it destroys such substances as fire will. Superheated steam, cooking in an oven, may do the work, but the instruments must first of all be cleaned. Such dressings as are used in the mouth should be made of gauze, impregnated with boracic acid (new), iodoform, or iodine solution, and according to the consensus of the best surgical authors such dressings should be as dry as possible. All operations which can be made as nearly bloodless as possible are to be considered most favorable. Moisture is the *bête noir* of the dental surgeon. It is on this account that the teachings of aseptic surgery cannot be fully utilized in oral operations It is, however, the duty of every surgeon to practice antiseptic surgery to the fullest possible extent, and to make and keep records of such work to encourage others to do likewise.

Section II, Dental Education, Literature, and Nomenclature, was called, and the report of the Section was read by its chairman, Dr. LOUIS OTTOFY, of Chicago. Since the last report, one dental college, the Dental Department of the University of Omaha, has been established, making a total of forty-eight now in operation and granting degrees. The number of matriculates at the last session, in the forty-two colleges reporting, was 5277 ; graduates 1226. Four years ago, twelve of the thirty-three colleges then existing graduated three-fourths of the entire number. Three years ago, ten colleges graduated 851 students, while the remaining twenty-eight graduated 632. This year six colleges graduated 525, the remaining forty-one, 701.

The Section considers the continuance of the publication of the list of dental books in the Transactions "inadvisable, as the necessary information is supplied in an admirable manner by the publisher of the DENTAL COSMOS, in its monthly bibliography, which contains from month to month a complete list of books published, and a handy reference list of all important papers read before dental societies, or published in other than dental journals. The most important work of the year, and the most valuable addition to dental literature in its history, is the Transactions of the World's Columbian Dental Congress, which appeared in December last, in two volumes. In line with the movement to substitute the term "stomatologist" for dentist, the *Pacific Coast Dentist* has changed its name to *Stomatological Gazette*. An addition to the list of journals is the *Dental Digest*, the plan of which, presenting a complete *résumé* of all that has appeared in the dental journals of the world, sifted of the chaff, condensed, and presented in a form in which it can be readily assimilated, is admirable, if it can be carried out.

The report on Dental Nomenclature will be presented by Professor Guilford, supplemented by a statement from Professor Molyneaux. Dr. Guilford will also present the report of the special committee on Nomenclature appointed last year. The Section also reports papers to be read by Drs. Stainton, Jack, Barrett, and Donnally.

Dr. C. W. STAINTON, Buffalo, read his paper, which was entitled, "Ought the Formation of Dental Schools be Limited?"

Dr. Stainton stated as the basis of his argument two premises, which would be conceded by all, namely : That in all civilized countries every individual comes, sooner or later, under the care of a physician and constitutes a part of the medical constituency; and second, that in medicine, which is as old as the human race, the law of supply and demand has long been practically established: the number of medical men in any community or country is a fair measurement of the number needed in that community or country.

The following table (1895 estimated) shows the proportion of physicians to the general population in this country, according to the census reports, from the time physicians were first enumerated separately in 1850, which reaches back to 1840, and practically covers the period of dental education in this country:

*Table I.*

| CENSUS. | POPULATION. | NO. OF PHYSICIANS. | AV. POP. TO PHYSICIAN. |
|---|---|---|---|
| 1850 | 23,191,876 | 40,765 | 570 |
| 1860 | 31,433,3-2 | 55,159 | 570 |
| 1870 | 38,558,371 | 62,448 | 617 |
| 1880 | 50,155,783 | 85,671 | 586 |
| 1890 | 62,622,250 | 104,803 | 597 |
| 1895 | 70,500,000 | 120,000 | 587 |

The average population to each physician from 1840 to 1890 is 588, which gives for 1895, 120,000 physicians. Percentage estimated on growth from 1870 to 1890, gives about the same results. Dr. Stainton produced other evidence that 120,000 is not too high a figure for the number of physicians at the present time.

With about five medical schools in existence in 1800, there have since been formed nearly three hundred more, of which fully fifty per cent. have died or been absorbed by stronger institutions. From the best data attainable, Dr. Stainton had thought 140 to be about the number now in operation; but Mr. Lovick Pierce, acting commissioner of education, had supplied him with data from the yearly reports of that office showing the numbers of medical schools at the various periods named to be: In 1860, 46; in 1870, 72; in 1880, 90; in 1890, 116; in 1895, 156.

The next table shows the comparative growth along medical and dental lines:

*Table II.*

| CENSUS. | POPULATION. | NO. OF PHYSICIANS. | AV. POP. TO PHYSICIAN. | NO. OF DENTISTS. | AV. POP. TO DENTIST. |
|---|---|---|---|---|---|
| 1850 | 23,191,876 | 40,765 | 570 | 2,923 | 7,934 |
| 1860 | 31,443,322 | 55,159 | 570 | 5,606 | 5,607 |
| 1870 | 38,558,371 | 62,448 | 617 | 7,839 | 4,918 |
| 1880 | 50,155,783 | 85,671 | 586 | 12,314 | 4,154 |
| 1890 | 62,622,250 | 104,803 | 597 | 17,498 | 3,579 |
| 1895 | 70,500,000 | 120,000 | 586 | 25,000 | 3,134 |

Dr. Stainton believes that, although the number of dentists above given might seem too large, it was probably too small, in partial support of which he presented the following table of fifty of the largest cities, which, while not exact, has been prepared with care and with the best assistance he could enlist. Such errors as there are are on the safe side:

*Table III.*

| CITY. | Population. | Phys. | Aver. Pop. to Phys. | Dent's. | Av.Pop. to Dent's. |
|---|---|---|---|---|---|
| 1 New York, N. Y | 2,000,000 | 3500 | 571 | 1200 | 1666 |
| 2 Chicago, Ill | 1,700,000 | 2722 | 624 | 704 | 2414 |
| 3 Philadelphia, Pa | 1,200,000 | 2357 | 509 | 526 | 2280 |
| 4 Brooklyn, N. Y | 1,000,000 | 1561 | 626 | 528 | 1852 |
| 5 St. Louis, Mo | 600,000 | 1190 | 504 | 160 | 3750 |
| 6 Baltimore, Md | 600,000 | 915 | 559 | 185 | 2767 |
| 7 Boston, Mass | 500,000 | 875 | 569 | 325 | 1538 |
| 8 Cincinnati, O | 350,000 | 695 | 432 | 150 | 2000 |
| 9 Cleveland, O | 350,000 | 601 | 576 | 114 | 3070 |
| 10 Pittsburg and Allegheny, Pa | 350,000 | 586 | 597 | 140 | 2500 |
| 11 Buffalo, N. Y | 350,000 | 544 | 643 | 140 | 2500 |
| 12 San Francisco, Cal | 350,000 | 827 | 421 | 241 | 1452 |
| 13 New Orleans, La | 300,000 | 307 | 977 | 88 | 3409 |
| 14 Milwaukee, Wis | 270,000 | 200 | 1350 | 90 | 3000 |
| 15 Washington, D. C | 270,000 | 600 | 450 | 226 | 1194 |
| 16 Detroit, Mich | 260,000 | 400 | 650 | 125 | 2080 |
| 17 Minneapolis, Wis | 225,000 | 340 | 661 | 80 | 2812 |
| 18 Newark, N. J | 215,000 | 242 | 888 | 86 | 2500 |
| 19 St. Paul, Minn | 190,000 | 174 | 1092 | 70 | 2714 |
| 20 Jersey City, N. J | 180,000 | 170 | 1058 | 40 | 4500 |
| 21 Louisville, Ky | 180,000 | 360 | 500 | 53 | 3396 |
| 22 Kansas City, Mo | 160,000 | 450 | 355 | 85 | 1882 |
| 23 Rochester, N. Y | 150,000 | 325 | 461 | 70 | 2142 |
| 24 Indianapolis, Ind | 150,000 | 385 | 389 | 70 | 2142 |
| 25 Omaha, Neb | 140,000 | 190 | 736 | 25 | 5600 |
| 26 Troy and Suburbs, N. Y | 140,000 | 166 | 843 | 30 | 4666 |
| 27 Worcester, Mass | 130,000 | 175 | 742 | 53 | 2452 |
| 28 Providence, R. I | 130,000 | 314 | 417 | 75 | 1733 |
| 29 Toledo, O | 120,000 | 204 | 588 | 35 | 3428 |
| 30 Denver, Col | 120,000 | 450 | 266 | 85 | 1411 |
| 31 Columbus, O | 120,000 | 268 | 458 | 40 | 3055 |
| 32 Syracuse, N. Y | 116,000 | 200 | 580 | 50 | 2320 |
| 33 Atlanta, Ga | 100,000 | 250 | 400 | 38 | 2631 |
| 34 New Haven, Conn | 100,000 | 170 | 588 | 43 | 2325 |
| 35 Albany, N. Y | 100,000 | 225 | 444 | 30 | 3333 |
| 36 Grand Rapids, Mich | 85,000 | 188 | 452 | 46 | 1804 |
| 37 Richmond, Va | 85,000 | 220 | 386 | 60 | 1416 |
| 38 Nashville, Tenn | 85,000 | 200 | 425 | 38 | 2236 |
| 39 Paterson, N. J | 80,000 | 85 | 941 | 20 | 4000 |
| 40 Wilmington, Del. | 70,000 | 100 | 700 | 20 | 3500 |
| 41 Seattle, Wash | 60,000 | 117 | 512 | 33 | 1818 |
| 42 Hartford, Conn | 60.000 | 120 | 500 | 40 | 1500 |
| 43 Camden, N. J | 60,000 | 116 | 515 | 20 | 3000 |
| 44 Springfield, Mass | 52,000 | 128 | 406 | 32 | 1625 |
| 45 Chattanooga, Tenn | 50,000 | 100 | 500 | 20 | 2500 |
| 46 Sioux City, Wis | 50,000 | 60 | 833 | 15 | 3333 |
| 47 Tacoma, Wash | 45,000 | 80 | 562 | 25 | 1800 |
| 48 Portland, Me | 38,000 | 90 | 422 | 26 | 1461 |
| 49 Akron, O | 30,000 | 57 | 526 | 20 | 1500 |
| 50 Salem, Or | 15,000 | 40 | 375 | 12 | 1250 |
| Total | 14,081,000 | 24,639 | 571 | 6427 | 2190 |

This table shows the estimate of the number of dentists to be too low. The writer had not found any list in a city directory which was not below an accurate compilation. The table shows, also, that the distribution of dentists is pretty universal. The proportion is greater in the smaller than in the larger cities. Thus the ten largest cities in the list average one dentist to each 2152 inhabitants, while the ten smallest have an average population of 1892 per dentist. No one doubts that the rural communities are well supplied. The population of the fifty cities named is in round numbers 14,081,000, or twenty per cent. of the entire population; the number of dentists in these cities—6427—multiplied by five would give a total of over 32,000 for the country at large.

The following shows the production of dentists during the last decade, the falling off from 1892 to 1893 being explained by the adoption of the three years' course at that time:

| YEAR. | NO. OF SCHOOLS. | GRADUATES. |
|---|---|---|
| 1886 | 24 | 503 |
| 1887 | 28 | 597 |
| 1888 | 29 | 746 |
| 1889 | 31 | 796 |
| 1890 | 33 | 963 |
| 1891 | 33 | 1241 |
| 1892 | 39 | 1483 |
| 1893 | 35 | 379 |
| 1894 | 47 | 905 |
| 1895 | 48 | 1208 |

An attempt to get from many sources estimates of the percentage of the population in various cities who employ dentists resulted in fifteen returns, ranging from fifteen to sixty-five per cent., with an average of twenty-five cent., which is probably too high. Another attempt was made to get at the point by formulating an idea of the average number of people making up the clientele of a reputable practitioner, but the task was difficult. Where the writer could call and explain what was wanted, there was no difficulty; but the effort to get the information by correspondence from comparative strangers was not so successful. In a discussion before the Illinois State Dental Society in May, 1894, the consensus of opinion was that a man could care for only about five hundred patients each year. Dr. J. D. Thomas some years ago received estimates from ten of the leading practitioners of Philadelphia, showing the average number of patients each year to be about four hundred. These last figures are probably too low, as the dentists furnishing the data were those having a choice clientele; and the rule is that as the practice becomes choice the number almost necessarily diminishes. Estimates received by the writer from thirty different dentists, all of good repute, in various sections, vary from a little over 300 to 1000. His own estimate of the average would be about 600, which would give for the 25,000 dentists a constituency of 15,000,000; and he thought it very doubtful whether we have any such number. It must be remembered that during the period under examination we have received 15,000,000 immigrants, who became at once on their arrival a part of the medical constituency, but were in no sense, except by slow education, a part of our dental constituency.

The deduction from these statistics is that the dental ranks are as full to-day in the United States, in proportion to the demand, as the medical ranks. Quite a percentage of medical graduates abandon practice because their calling is so overcrowded. The overcrowding of our ranks in any locality is prolific in cheap and nasty practitioners, and the lowering of the standard and character of our specialty. The overproduction of dentists is not a good thing, either for us or for the public. We cannot forbid any young man the study and practice of dentistry ; but raising the standard of admission to the colleges and lengthening the course of study, so that it takes as long and costs as much to enter dentistry as medicine, will do much to deter from the hasty entering of dental schools. The multiplication of dental schools is the chief danger in this direction. There are about one hundred and fifty medical schools. An equal proportion would give us thirty dental schools. In medicine there is a school to 770 practitioners ; in dentistry, one to 400. The multiplication of dental schools and the overproduction of dentists will cure itself in time ; but that is an expensive method.

Dental schools are not being formed now from an educational necessity. Two impulses now control this matter,—first, personal ambition to have a position in and be connected with a dental school for the prominence it is supposed to give ; and, second, a purely commercial spirit on the part of medical schools. Over sixty per cent. of our schools are appendages to medical institutions, and nearly every dental school started in these later years has been under this outside influence.

We have the moral right and the proper organization to cure this evil. The National Association of Dental Faculties ought to at once serve notice : "That hereafter no dental school would be accepted under any circumstances unless the consent of the association had been first asked and received for its formation." This is the course adopted of necessity by the chief religious bodies in all our large cities. The Faculties Association has proved its character and wisdom beyond the largest expectation. A body which can modify and improve at every point its own interests, constantly bettering the condition of everything it touches with its scepter of power ; that can chastise its own members, no matter how old or intrenched in position, yea, better, can reach outside its own circle and correct and punish the unseemly behavior of older institutions who seem to feel a call to lord it over us ; an organization which has done all this without even the smell of fire being found upon its garments need not hesitate to undertake any needed reform. The moral force of twenty-five thousand dentists, yea, of all the world, would sustain it in such a movement.

Dr. Louis Jack, Philadelphia, read a paper entitled, "Should Not the Increase of Dental Schools be Restricted ?"

Referring to the rule of the National Association of Dental Examiners that a prerequisite to application for recognition by that body must be previous admission to the National Association of Dental Faculties, and the requirement of the latter body that an applicant for admission to its ranks shall have the indorsement of the Board of Dental Examiners of the state in which it is located, Dr. Jack gave as one of the reasons for their adoption the conviction of both bodies, that the increase of schools was proceeding at too rapid a pace. There was also a sentiment that a greater requirement than additional schools was an extension of the field of instruction, and an enlargement of the curriculum of the colleges already recognized; that the newer schools and those under organization are not being installed with the equipment of faculties and instructors they should have.

In 1891 there were twenty-four schools recognized by the National Association of Dental Examiners; in 1892 one dropped out of existence and five were added to the list, making twenty-eight recognized schools. In 1893 there were eight unrecognized schools; in 1894, fifteen. Of these, three have been recognized this year, making thirty-one recognized schools, while there are now eighteen unrecognized. The diploma of an unrecognized school has a legal value in the state where the school is located; it gives no *prima facie* right to practice elsewhere without examination by the state board, and in some states the holder would not have the privilege of being examined.

A manifest tendency is now in the direction of the establishment of dental departments in connection with medical schools. Of the thirty-three schools in the Faculties Association in January, 1895, but five are of this class, while of the ten listed outside of this association seven are of this class, and of seven unlisted schools five are of this kind, and others are in contemplation. It does not augur well for the interests of the dental profession that the generality of the medical schools entering into this enterprise are not leading ones. Well-established and strong medical schools have no disposition toward such extension. They have not the room or the facilities to honorably engage in it. In reference to dentistry, this now requires an installation far beyond what the ordinary medical schools can furnish.

Dr. Jack then noted in a general way the requirements for teaching dentistry properly, and showed the difference between a dental department attached to a medical school and one affiliated with a university, and the advantages which the latter has over the former. In view of the fact that there are over one hundred and fifty medical schools in the United States, it does not require any stretch of imagination to perceive the danger which lies before us in the direction indicated. Neither is there any question, in view of these considerations, that some restriction should be placed on these institutions, unless they make equal provision for instruction with the best-equipped schools already in existence. Referring to the estimate in which the American dental degree is held in Europe, Dr. Jack concluded that in case some brake is not put upon the addition of dental schools which are not of a high order, the prejudice against the dental institutions of this country must further increase. In this country the states cannot regulate the number of schools, which may increase to injure one another by surpassing the demand; but in the survival of the fittest the public suffer by the degradation of the standards, and, consequently, from the inferior qualification of the product. In Europe these questions are carefully governed by the state. Here the crystallization of sentiment into law is more lax, is inharmonious, and uncertain of enforcement; and therefore we have to depend upon the development of opinion to assist and support such bodies as the Associations of Faculties and Examiners in the formulation of rules to guard the interests of all concerned, and to aid in checking the degradation of our profession.

Dr. W. C. BARRETT, Buffalo, N.Y., read a paper entitled "Whither Are We Drifting?" Premising that dentistry is an integral part of medicine, and that there is a constant extension of the field, a more complete comprehension of the principles involved, and an expansion of the benefits conferred, thus augmenting the work to be done, Dr. Barrett held that the demand for dentists would increase in a greater ratio than the population.

At the close of the Revolutionary war the population of the country was about 3,500,000, with probably not more than 20 dentists, giving one to 175,000 of population. But the dentistry of that day was limited in scope and the operations few indeed.

In 1830 the population was about 12,750,000, and the dentists about 700, one to about 18,000 population. The scope of dentistry had been materially broadened, but had not yet invaded any part of medicine.

In 1850 the population was 23,000,000, with 2923 dentists, one for each 7800 of the population. Then came the advent of rubber and a horde of young men, only a small proportion of whom came into dentistry by way of the colleges, which had then commenced their beneficent work.

About the year 1870, when the population had reached 38,500,000, educational ideas had permeated dentistry, and dental legislation was repressing the ignorant. More colleges had provided better means for education, and a diploma was recognized as the first essential for proper practice. The scope of dentistry was immensely expanded, and the necessity for medical training was beginning to be recognized. There was room for more dentists because of the greater field they occupied, and the census showed in consequence 8732 dentists, one for each 4400 of population.

We now have a population of near 70,000,000, with over 23,000 dentists, allowing one for each 3000 of population. Yet the amount of work done by each individual dentist is much greater than when there was but one practitioner to 175,000 population. We have nearly fifty colleges, each doing something toward extending the field of dentistry. Dentists this year are performing operations and treating conditions unthought of last year. It is but a few steps back in the memory of some of us when any surgical interference on the part of the dentist beyond the extraction of teeth would have been deemed a violent assumption, while to assume the treatment of any oral disease would have subjected him to censure. His practice was confined to the filling of holes in teeth and prosthetic work exclusively, and he was rated in the community as only one degree above the shoemaker. To-day a considerable portion of this body has entirely abandoned mechanical work, a fact which is evidence of the broadening of our field and of the tendency toward a division into specialties, as in medicine. Extraction is now largely relegated to the man who does nothing else; the dentist writes his prescription for and directs the treatment of a large and constantly augmenting list of human ailments. While dentists have greatly multiplied in number, the wails of the pessimists who declare that the colleges are turning out graduates at a rate that must soon make their number greater than that of their patients, come mostly from the old-time practitioners who have not broadened their practice with the advance of modern ideas or kept pace with professional progress. They forget that the colleges are year by year digging the stream deeper and making it wider in a greater ratio than they are peopling it with occupants.

The profession is growing in importance at a rate that no educated body of men has yet emulated. We can easily see the time when there will be fifty thousand dentists in this country. What are we doing toward securing an organization that shall make of them the most effective body of practitioners the world knows? The American Dental Association, with a membership of about two hundred and fifty, comes the nearest to being a true national association. What shall be done to increase our representation? Evidently something to promote the communistic side of our meetings. This, it seemed to the writer, must be by division rather than wider aggregation. There is little in common between the representative from New England and the one from the great southwest. A line drawn midway between the eastern and western extremities of the United States would fall in the Pacific Ocean three hundred miles west of San Francisco. The country is too large to make this association really representative. It is impossible for the members from all sections to meet at one central point, and if it were, there is not a sufficiently intimate acquaintance among them to tempt them to travel so far.

The efficient organization of the dental profession for the future demands a different course from that of the past. We should have a number of great societies, meeting annually, with perhaps delegates from each of them to form one central association, which may meet either at a fixed point or itinerate among the different sections. It would be invidious to propose a special form, but it would seem that we naturally tend toward four aggregations: one for the East, one for the West and Northwest, one for the South and Southwest, and one for the trans-montane portion of the country.

The American Dental Association has not yet served its full purpose, but what can we do to make it more effective? Some years ago a committee appointed to consider this very matter, after two years of careful study, unanimously arrived at a conclusion, and presented certain amendments to the constitution, which they believed would result in great good. For three years that report has been before this body without receiving any special attention, although he had yet to hear of any special objections to it. All admit that the representation here is not what it should be, but nothing is done to improve it. Dr. Barrett hoped the matter would be thoroughly considered this year, and that we shall at least take steps to improve the social condition; that we shall bring here less of personal interests to be served; that we shall strive to keep out the mercantile spirit, and devote the time to affairs of a broad professional nature.

(To be continued.)

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The following were adopted during the sessions:

Offered by Dr. M. F. Finley :

*Resolved*, That this association formally adopts the Army Medical Museum and Library as the National Museum and Library of the dental profession of the United States.

Offered by Dr. Wms. Donnally :

*Resolved*, That a committee of five be appointed by the chair to co-operate with the Army Medical Museum and Library Managers in enriching its stores of dental literature and museum specimens, especially by appealing to dental societies and individual members of the dental profession for material assistance.

The committee appointed in pursuance of the latter resolution consists of Drs. Wms. Donnally, of Washington, D. C. ; J. Taft, of Cincinnati, O. ; H. J. McKellops, of St. Louis, Mo. ; Frank Abbott, of New York city ; and Henry W. Morgan, of Nashville, Tenn.

Offered by Section V, to which had been referred a memorial on the subject from the Dental Society of the State of New York :

*Resolved*, That the American Dental Association condemns the use of secret preparations known as "local anesthetics," as well as all other secret preparations.

Offered by Dr. H. L. Ambler :

*Resolved*, That it is the sense of this association that the National Association of Dental Faculties can largely control the formation of dental colleges by passing a resolution refusing to admit any college to their association of which the organizers did not first apply for and obtain permission from the National Association of Dental Faculties to organize such institutions.

Offered by the Executive Committee :

*Resolved*, That at the session of the American Dental Association to be held in 1896, the general sessions shall be held every morning and at such other times as may at the pleasure of the association be designated ;

*Resolved*, That the sections shall be required to hold separate meetings simultaneously during the day, and that all papers pertaining to the sections shall be read and discussed in the sections ;

*Resolved*, That at the *general sessions*, one hour each session shall be devoted to the president's address, the general addresses prepared by appointment, and such other papers as embrace the results of original investigations as may be recommended by the appropriate section ;

*Resolved*, That at the general sessions reports embracing only a syllabus shall be made of the papers which shall have been accepted at the individual sections, these reports to be presented by the representative of said section : meaning hereby that the work must be done in the sections ;

*Resolved*, That all papers which have been accepted by the several sections shall be published in the Transactions of the association, with the discussions thereon.

Saratoga Springs was selected as the place for the next meeting, and the following were elected officers for the ensuing year : J. Y. Crawford, Nashville, Tenn., president ; James McManus, Hartford, Conn., first vice-president; Thomas Fillebrown, Boston, Mass., second vice-president; George H. Cushing, Chicago, Ill., recording secretary; Emma Eames Chase, St. Louis, Mo., corresponding secretary; Henry W. Morgan, Nashville, Tenn., treasurer; J. N. Crouse, Chicago, Ill., Louis Ottofy, Chicago, Ill., and V. H. Jackson, New York city, members of executive committee. Drs. A. W. Harlan, of Chicago, and E. T. Darby, of Philadelphia, were appointed upon the Publication Committee; and Drs. H. J. Burkhart, of Batavia, N. Y., A. C. Rich, of Saratoga Springs, N. Y., and A. M. Wright, of Troy, N. Y., as local committee of arrangements.

## TRI-STATE DENTAL MEETING.

(Continued from page 700.)

### FIRST DAY—*Continued.*

DR. E. T. LOEFFLER, Saginaw, Mich., read a paper entitled "Habit Spasm," of which an abstract follows:

Habit spasm really belongs to a class of diseases in which there are no constant changes to be seen with the naked eye. They were formerly included under the term "functional diseases," but microscopical studies show more than a mere disturbance of function and make it clear that most of these maladies depend upon alterations in the nutrition of the nerve-elements, though these may not yet have been found. The first and greatest difficulty is to determine the cause of the derangement of function and the manner of its proceeding, because scientific investigations in this field are very incomplete. Because of the breadth of the entire subject, the writer would confine his discussion to a single phase of it, "facial spasm," as the cases of most importance to the dentist are those in which contraction or spasm of voluntary muscles is brought on by reflex irritation from the teeth.

Children often, adults sometimes, present spasmodic movements—as winking, twitching the mouth, jerking the head—which have a half voluntary aspect, but which the individual cannot control. The patient is said to have "got a trick" of moving the part. S. Weir Mitchell calls this "habit chorea," but habit spasm is perhaps the better term. The condition is met with chiefly in childhood, especially in the second half, but it sometimes commences in youth and even in adult life. In young women it is often associated with symptoms of hysteria, and there may be difficulty in deciding whether certain spasmodic movements are examples of reflex dental neurosis, of habit spasm, or of hysterical spasm. When it commences in childhood the affection commonly ceases after a few months or years, but it occasionally goes on to middle life or even longer. Rarely it begins late in life, and is then generally permanent. In early life it occurs especially in nervous, excitable children; more commonly in females than in males, but is often seen among boys. It usually begins between the ages of six and fourteen, but has been known to commence at four. Some claim that impairment of general health precedes its development; occasionally it appears due to some special influence depressing the nervous system, overwork at school, a fright, or an injury. Frequently there is a history of other neuroses in parents or relatives ; quite probably the affection often arises by irritation, even unconscious. In many cases no causes can be traced, and the affection seems to result from the restlessness of childhood, specialized in a particular direction.

The movements usually occur at intervals of a few minutes, but sometimes are almost continuous, and the character varies, even in the individual. When they persist, they become a source of great annoyance to the adult patient, and the inability to control them by the will becomes marked. A relative of the writer's, a girl, began to blink the eyes in early childhood, and still did so at the age of thirty. A clergyman of thirty-seven was greatly annoyed by an involuntary smile of somewhat meaningless aspect which would cross his face from time to time without the slightest corresponding emotion, even in the most solemn parts of the church service. It had commenced when he was sixteen years old. A gentleman of seventy first perceived the trouble, which began six years ago with a slight twitching of the muscles under the right eye, with no pain at any time. A year later the right upper cuspid was extracted, without relief, and to-day all the upper teeth are wanting, and the trouble still exists, being periodical in its nature, and the right eye partly closed. In the case of a lady of about forty, the trouble, a twitching of the left masseter muscle and of the lower eyelid of the same side, came on four years ago. She consulted several physicians, and finally the writer had extracted all the diseased teeth in her mouth, but had not been able to get any word as to the result.

There are many well-marked cases in which the cause of this muscular disturbance of the face was clearly due to irritation reflected from diseased teeth. The subject is of profound interest and importance, but is little understood. It seems to be apparent that there is some abnormal relation between efferent and afferent nerve impulses. The centrifugal or outgoing impulse does not seem to follow the usual or normal tracts outward, thus resulting in effects that can at present not be explained by known laws.

Inasmuch as "habit spasm" is generally increased by observation, it is important that little notice be taken of the movements by friends of the patient. Sometimes they will then cease without further treatment. They are seldom under direct voluntary control, and the endeavor to prevent their occurrence may be futile, especially under threat of punishment, though the promise of a reward at the close of each day on which no spasm has occurred will sometimes gradually cause their disappearance. Obvious defects in health must be made good ; change of air is beneficial, especially with change of companionship. Of drugs, arsenic has certainly most influence. Nerve tonics may be added with advantage. After describing somewhat in detail the treatment of the condition, Dr. Loeffler said that the great tendency of to-day is toward specialties in medicine. The specialist, including the dentist, is too much inclined to become confined to his branch of study and to ignore the human system as a whole, unless he has been well grounded in general practice of several years' duration. The most successful specialist is he who is a good general practitioner from whose practice has come his special work. The best all-around dentist is he who has been and is a good general practitioner.

Dr. W. C. Barrett, Buffalo. The subject of this paper, spasms which may become habitual, should interest every one of us. We must work on something besides the teeth, if we are to be members of the medical profession. We must consider other tissues besides enamel and dentine and pulp. The consideration of the cerebro-spinal nervous system, particularly, falls within the province of the dentist. A man may very easily get into the habit of almost anything, and have great difficulty in leaving it off. Habit is dominant over us. How? By accustoming the nervous energy to flow in some particular direction. You have seen persons begin doing something entirely voluntarily, and afterward, by accustoming the nervous force to flow in that direction, it becomes a habit which they cannot break off.

The best mode to combat this condition is to establish some kind of a counter-irritant, to start a flow of the nervous force in some other direction, through a different set of muscles. A nervous sedative, of course, will be very useful. When you have, for instance, a spasmodic action of the depressor anguli oris, or a drawing back of the zygomaticus major and minor, or some spasm of a particular muscle,—and which it is you must first determine,—a good method of treatment is to cover some convenient locality, at a little distance, with a cantharidal solution, and absolutely produce vesication. After that has recovered, if the spasm is not cured, then put another one in another place. You may even do it by painting it over, possibly, with tincture of iodine. You may do it by scarification, and then, in the scarification, in the little penetrations, you may rub in some kind of an irritating solution, so that by metastasis you may remove the source of irritation or change the flow of the nervous supply, and thereby produce a cure.

Dr. R. T. Oliver, Indianapolis, referring to the statement that the practice of medicine is running to specialties, said that dentists, with the others, were prone to practice within the confines of their specialty, and to ignore therapeutical treatment outside of the regular routine of their daily work. This he believed a grievous mistake, and probably owing to the fact that dentistry being one of the newest professions the majority of its members yet adhere to the "old school," combatting all presenting conditions with simply mechanical applications, not as the educated dentist should, by scientific therapeutical and surgical remedies, as well as artistic mechanical methods. "Habit spasm," or preferably "habit chorea," as produced by dental irritation, usually affects the muscles of the face and neck, is more often observed in females than in males, and is more liable to occur about the time of dentition,—eruption of deciduous or permanent teeth. Of course it may come from a pathological condition of a tooth, at any time, as from pulp-stones or exostosis constricting or impinging upon the nerve-fibers; cases of this last class rarely last long, the involuntary twitching of the muscles ceasing after the peripheral irritation is removed. So-called teething spasms of babies usually subside after the tooth is through the gum. Although it is disputed that teething spasms are a form of chorea, the writer believes that they are.

Habit spasm caused by dental irritation during the eruption of the permanent teeth, from the fifth to the thirteenth, lasts longer, and is harder to combat, causing the practitioner to leave the rut of routine and use his therapeutical knowledge diligently. In ninety per cent. of these cases the choreic movements will be found to have commenced with the eruption of the first permanent molar. If the condition is inherited, or if there is a family history of phthisical, scrofulous, rachitic, or syphilitic taint, usually the habit spasms continue with more or less frequency until after the eruption of the second molar, when they cease till the third molar again starts the trouble. Arsenic is the most valuable remedy, Fowler's solution, after meals, commencing with three drops and increasing to ten, provided that no toxic effects of the drug appear. Iron, cod-liver oil, and quinin may be given in combination with the arsenic if the patient is anemic, or if good results do not follow the arsenic alone. Study should be interdicted, plenty of good food and fresh air provided, encouragement and praise freely bestowed; mimicry, confinement to the house, deprivation of reasonable pleasures, unnecessary crossness of parents, are all harmful. Perhaps the most trying form of the disease is produced by arrested eruption of the third molar. Young women are dosed incessantly, and even operated upon, for so-called female weakness, when the trouble is choreic spasms, perhaps produced by dental or ocular irritation. Dr. Oliver related a case in point, that of a young lady who had been under the care of a physician for eighteen months for supposed uterine trouble, showing itself in reflex muscular spasms of the face, neck, and shoulders. She was referred to him for examination of her teeth. An impacted left superior third molar was removed, with a portion of necrosed process, and the patient's usual health returned in three weeks.

Hypnotism, or suggestion, has recently been claimed to afford permanent relief for choreic spasm, as well as of other neurasthenic conditions.

Dr. R. W. Morse, Lansing, Mich., would like to ask Dr. Loeffler what the indication would be for the removal of such teeth as he has referred to in his paper, for the relief of these difficulties?

Dr. Loeffler. As stated in the paper, every possible cause ought to be looked for. If there are diseased teeth on the same side on which the spasm occurs, they should be carefully looked to. Of course every tooth that can be saved should be. He did not mean to convey the impression that teeth ought invariably to be extracted, without special examination. In every case where there is a habit spasm we ought to give it careful attention, and not drop it because we do not at once see any benefit derived from treatment.

### *Evening Session.*

Dr. W. C. Barrett, of Buffalo, delivered a lecture in the college amphitheater, on bacteriological pathology, with lantern illustrations.

### Second Day—*Morning Session.*

The convention was presided over by Dr. W. H. Todd, president of the Ohio State Dental Association.

Dr. S. B. Hartman, Fort Wayne, Ind., read a paper entitled, "The Dentist in His Profession and Among the People," of which an abstract follows:

The central thought in Dr. Hartman's paper was that the dentist, in order to receive proper recognition, must know something more than the mere details of his every-day work. The first thought as to what relation a dentist sustains to his country and profession is his first step as a student. While mechanical skill, which he would in no way depreciate, is of great importance, yet if our profession is to stand side by side with other professions it must find its coming members not merely of those with an inclination for mechanics, but of those who combine with this a knowledge of scientific and physical laws and a general understanding of those studies that will tend to an education that will admit the student to the society of the learned professions. He rejoiced that the colleges are making the examination for admission of a high standard. The better the general education of the dental student, the better will be the dental practitioner, not only as a dentist, but as a citizen. He would also make morality a consideration of admittance to the profession. Coming in contact often with those of sensitive nature, how important for the welfare of the dentist, and of the community in which he lives, that his character be above reproach ; hence character is paramount in the admittance of a student.

After the student, the next consideration is the practitioner. An education outside of his profession is of great importance, that he may not only be admitted, but sought after, among the best society of the place where he resides. While it is true to an extent that we have comparatively few men of attainments beyond what is required in the care of teeth, yet there are many who are taking advanced standing and endeavoring to raise dentistry to the sphere it should occupy. Dental societies help to broaden thought—the mingling of persons having like interests incites a zeal to advance. Local societies have a salutary influence on each member. Dr. Hartman believes that great good would be obtained if each alternate meeting could be devoted to questions not pertaining strictly to the profession, as history, biography, current events.

We all have a peculiar influence on others. Science teaches that no force is lost, but goes on and on. A great writer says, "The meeting of persons on the street has an unexplainable influence, and little do we know to what extent it may extend." Apropos of this thought, Dr. Hartman told of a call he made upon a dentist in Detroit, who had been casually mentioned to him by a friend as one who had made the study of microscopy one of his pleasures outside of professional duties. Little was said between them of dental practice, much of their conversation pertaining to things not visible to the naked eye, but it seemed to the writer that great fountains of knowledge had opened to him during the interview. We should not live entirely within the four walls of our office. Better that a dentist should have one dental journal and two literary, than two dental journals and no literary magazine.

How can the attendance of our associations be increased? The small attendance is not entirely from outside causes. Dentists not members desire its privileges and enjoyments, but do not become members lest certain restrictions conflict with their ideas of conducting their practice. In one of the states represented here to-day are five hundred dentists, and the entire membership of its state association is only about eighty, and an attendance of fifty members would be considered large. The four hundred and twenty dentists not members are largely composed of men from the same schools as the association members, who during college life stood side by side with them, passed the same professors, and have good standing in society. What is needed is a great outreach to those out of our association. It may be that some of the minor regulations of its management should be changed. Dental colleges graduate students as worthy; why do not the associations receive them? Either the colleges graduate men whose practice is not in accord with dental ethics, or the associations are at fault.

Dr. J. C. Walton, Howell, Mich. Almost every one in the past did as many now do, neglect their preliminary education as something not needful for a successful dental career; while the fact is that the higher we rise in culture and refinement the more our lives, and the world, must become to us. Good and bad luck are little else than good and bad training. Men embrace their chances because they have education sufficient to see them. One supplies the dental needs of a patient with artistic bridge-work and pockets a large fee; another applies the forceps and follows with a five-dollar set of artificial teeth,—perception versus blindness. Not one in fifty of our fraternity are students in the sense the speaker would have them. The systematic use of our reason, as developed by early habits of study, must be added to mere finger-craft, if we are to be considered educated dentists. We do not expect a student to make a perfect gold crown without much practice; so we should not expect him to reason out the inharmony of placing such a crown on an incisor root, unless he has exercised his mind in observing the connection of ideas and, following them in train, sees the result before he has begun, is shocked by the incongruity, and chooses a less objectionable way.

The differences so observable in men's understandings do not arise so much from natural faculties as from acquired habits of use. This, in a broad sense, is education. An educated man is one trained to methodical thinking, and whose memory is a magazine of facts. The school is the mental training ground, and books the source of supply for his memory. It is estimated that a common-school education adds fifty per cent. to the productive power of the laborer, an academic education one hundred per cent., and a university education from two hundred to three hundred per cent. At this meeting are met at every turn the trained faculties and polished manners of educated men. What wonder if there is lack of sympathy between such and the "hewers of wood and drawers of water" in the profession? The advantages of education to mechanical skill may be illustrated by reference to Watt, Cartwright, Whitney, and Fulton. If Stephenson and Edison seem exceptions, we point you only to their hard work in self-education, and still claim that all the great steps have been taken by trained thinkers.

Dr. Hartman is also right in urging this question from the point of citizenship. Ever since our ambitious and egotistical forefathers formally declared, "We are a specialty in medicine," the obligation has been on every admirer of the code to make himself a medical man. While many have hoped to share medical honors by this flimsy fiat, "we are," the fact remains that before the courts and in the public mind we are not. Then let us get all the credit we can as skillful dentists by being what we wish to seem. Most of our enjoyment, however, will continue to come from the confidential and social positions accorded us by the citizen friends of the commonwealth in which we live.

There are evidences in our current literature that some are beginning to take statesmanlike views of our profession. This is a hopeful sign. Our position relative to other professions, to our *confrères*, our competitors, our patients, the public, and the privileges that duty to our family dependents and ourselves demands, seem to afford vital topics too little discussed, that outrank history and biography as fit subjects for dental conventions. Dental societies have accomplished much. The representative plan of the American Dental Association and its satellites has been wise. But times are changing, and there is evidence that the objects of organization for the future society will be the greatest good to the greatest number, instead of organized support to the imaginary dignity of the elite. The writer waits anxiously the time when dental societies shall be made attractive to the majority, and shall be the special agency for the supervision, extension, and development of the profession as a whole. Looking to the future of dentistry, the question to-day most pertinent to its welfare is, What are they doing? If it be true that the educators of to-day are making sentiment for the future, as educators of the past have influenced us, he regretted that Dr. Hartman had not considered the effect of the dentist in his profession and among his people, who, in the interest of dental colleges, lobbies through state legislatures acts that juries decide to be class legislation; or who tries to place an embargo on the dentist of the poor; or who on examining boards passes out questions he cannot answer, yet upon which applicants must be marked; or who as college manager plays a confidence game with innocent seekers after dental instruction, and who solicits clinical patients by the same methods and in the same spirit which he declares unethical in individual practice.

Dr. J. TAFT, Cincinnati, had been impressed with the thought that more attention to such subjects as this should be given by those of us who are teachers, and who may have an influence on those who are coming into the profession in the future. It is a good thing for young men to appreciate that there is something more to be done by the dentist than the mere humdrum every-day work of his office. The broader his intelligence, the more power he will be able to exercise over his fellow-men, as we find illustrated in the medical profession. Occasionally we find a young man educated in this respect, and he goes out under vastly more auspicious circumstances than one who is crowded into the narrow groove of mere routine professional work. Though he may understand all the branches of the curriculum so that he is able to pass them well, there is a still broader range of knowledge that he ought to have, and that would help him greatly in his special work. This range includes the progress that is being made in the various departments of science, theoretical and applied, of which electricity is an illustration. Of course no one man can understand everything, but it is well that there should be a broad view of all these subjects. Last night we had an interesting presentation of the subject of bacteriology by Dr. Barrett. How many of us understand that subject as we ought? So we should have more knowledge of all the range of subjects that come within our purview, and then we shall better understand the causes of things, and do better work, than if we are simply crowded down to the narrow space of the every-day, technical, and operative duties of our profession.

Dr. W. H. JACKSON, Ann Arbor, Mich. The relation of the dentist to his patient is so close that he always of necessity leaves some impress; whether for good or evil depends entirely on the soul of the man who performs the operation. The Great Teacher said to his disciples, "Ye are the light of the world." So the dentists of the country are the light of the country, on the subjects with which they have to deal. We should carry a high standard, and we need that supplemental knowledge which alone can give the broad and grand view we should take of our work.

Dr. BARRETT. The influence that each one exerts is all-powerful. The keynote that is set at the commencement of a meeting will vibrate through it all. The influence of leading men like Chapin A. Harris, like Bond and others, is a powerful agent for the elevation of the profession. It is the duty of every dentist to feel that he is living in the eyes of the world; that he is the representative of a formative profession. At this time it is blossoming out, the calyx is opening, in the hope that hereafter the fruit shall ripen for the harvest. Dentists sometimes forget this. We are not living here simply for the amount of money we can make. The man who devotes himself entirely to the making of money is not the man who gets the most out of life. We are all acting on each other. The very contact with an active mind makes our own hearts sing with joy, makes them vibrate with all the activities of life; and when we put our own minds in harmony with others, how much we can do for the benefit of our fellows.

Dr. JOSEPH LATHROP, Detroit, read a poem, entitled "Fraternal Love," dedicated to the tri-state meeting, written by Dr. J. A. Robinson, a practitioner of sixty years' standing.

(To be continued.)

# UNION CONVENTION OF THE WASHINGTON CITY DENTAL SOCIETY AND THE MARYLAND STATE DENTAL ASSOCIATION.

(Continued from page 718.)

## FIRST DAY—*Evening Session* (Continued).

DR. GEORGE F. KEMP, of Johns Hopkins University, addressed the convention on the subject of

### NITROUS-OXID ANESTHESIA.

My interest was first particularly aroused in nitrous-oxid anesthesia some five or six years ago, while I was associate director in the Hoagland Laboratory of Brooklyn, and had charge of the experimental work in physiology and experimental pharmacology.

At that time Dr. G. W. Brush, a distinguished physician of Brooklyn, who had practiced dentistry for a number of years, came to me and spoke of some of the errors commonly taught regarding nitrous oxid, at the same time giving me the results of his large experience with the gas both in dentistry and in surgery. At his request we undertook, jointly, a research on the physiological action of nitrous oxid and obtained some valuable results. Since then I have continued to work on the subject from time to time, as opportunity was afforded. It was thought that some account of this work would be of interest to this association, so that I have been invited to address you on the subject this evening.

Before taking up the subject proper of the action of nitrous oxid on the system, I must ask your pardon if I refer to a few points on the physiology of respiration which are more or less familiar to you.

The chest cavity, which contains the lungs, is in reality an air-tight box with movable sides, made up of the ribs and sternum with the muscles about them, and with a movable muscular bottom, the diaphragm.

Inspiration is produced by a number of these muscles acting co-ordinately together, and moving the ribs, sternum, and diaphragm in such a way as to enlarge the chest cavity. This produces a partial vacuum, and, when the glottis is open, air passes in through the trachea and expands the lungs.

Normal expiration is a passive movement entirely. When the muscles of inspiration relax, the thorax resumes its former position, and the lungs, which are on the stretch during inspiration, squeeze out the air by their own elasticity.

The muscles which produce inspiration are under the control of a definite nerve-center in the medulla oblongata. Under certain conditions, especially when for any reason the blood becomes poor in oxygen, this center is stimulated, and it not only makes the ordinary muscles of respiration act with greater power, but it also calls into activity other muscles not concerned in quiet respiration, so that we have what is known as forced respiration. Under these circumstances expiration is no longer passive, as it is normally, but we have powerful expiratory muscles coming into play, whose duty it is to force the thorax together and help to drive the air out of the lungs.

The centers which govern these muscles of respiration are to some extent under the control of the will, but not entirely so. They usually act independently of volition, and, if strongly stimulated, will act in spite of volition and behave with a certainty that can be counted upon almost as a machine. This is what I wish to emphasize to explain their action during anesthesia. We may take a deep breath, or we may hold our breath at pleasure; but no one can commit suicide by holding his breath, for, after a time, the venosity of the blood becomes such a strong stimulus to the respiratory center that respiration takes place in spite of every effort of the will to prevent it. In persons drawn unconscious from a well this forced respiration is strikingly shown, and will often go on for hours, owing to excitation of these centers, even after the patient has been brought into the fresh air. Bear in mind, then, if you please, that these automatic respiratory centers do their work and *respond to stimulation* long after all higher centers of consciousness have succumbed.

In taking up the study of anesthesia by nitrous oxid, we must naturally begin with the blood, since it is by this that the anesthetic is carried from the lungs throughout the system. The blood normally contains three kinds of gas,—oxygen, carbon dioxid, and nitrogen. The oxygen is nearly all combined with hæmoglobin in the red corpuscles; the carbon dioxid is mostly combined with certain salts dissolved in the plasma; the nitrogen is simply dissolved in the plasma of the blood without relation to the salts. All water absorbs gases when brought in contact with them, and the water of the blood is no exception; so that, in addition to the oxygen combined with the hæmoglobin, there is a certain amount of free oxygen dissolved in the plasma, and the same may be said of a certain amount of carbon dioxid which is dissolved in a similar manner. For our purpose, however, we can disregard the oxygen and carbon dioxid, which is dissolved in the plasma simply by virtue of the water which it contains; though, when we study the effect of $N_2O$ on blood, we shall find that practically all of the anesthetic is taken up in this way. As long as any tissue is alive it consumes oxygen and gives off carbon dioxid, and the greater the activity the greater will be this gaseous exchange.

A careful study of the blood-gases in nitrous-oxid anesthesia, therefore, reveals not only whether the blood is incapacitated for carrying an amount of oxygen to the tissues requisite for their life, but also gives an idea as to whether the vital activity of the body as a whole has been depressed to any extent by the action of the anesthetic. I am still occupied with the study of blood-gases during nitrous-oxid anesthesia, and, as the work is not yet completed, there are some questions which must yet be held *sub judice;* but other results have been practically definite, and it is to these that I shall chiefly invite your attention.

When Sir Humphry Davy first advocated the use of $N_2O$ as an anesthetic, he advanced the theory that the gas was respirable, the tissues being able to appropriate the oxygen of the nitrous oxid for their own use, throwing off the nitrogen. Later this view was abandoned, and some teachers have swung to the other extreme, going so far as to say that nitrous oxid was really poisonous, forming a compound with the hæmoglobin of the blood which prevented this hæmoglobin from taking up oxygen, and, in fact, killing in the same way as carbon *monoxid.* A third theory, which is probably most widely taught to-day, is that nitrous oxid is not a true anesthetic, but produces anesthesia simply by asphyxia. All three of these theories are incorrect, the first two flagrantly so. We are all familiar with the old adage that "Where a candle will burn, life can be supported," but nitrous oxid is an exception to this rule. A candle will burn brightly in nitrous oxid and a smouldering stick will burst into flame, but life will soon become extinct. Analysis of the blood shows that it is doubtful if any nitrous oxid is decomposed in the system, and, if such is the case at all, the amount is so small that it need not claim our attention.

Concerning the second theory,—viz, that nitrous oxid is poisonous by forming a very strong compound with hæmoglobin, so that oxygen cannot be taken up,—I would say that this is likely due, to some extent, to certain writers, who, in quoting the work of others, have confounded *nitric* oxid with *nitrous* oxid. When oxygen unites with hæmoglobin, it forms a definite compound, which gives to arterial blood its bright color. As the blood passes through the systemic capillaries and gives up more or less of its oxygen, it loses this bright color, due to oxyhæmoglobin, as shown by the darker color of the blood in the veins. In the pulmonary circulation, the hæmoglobin, which had lost its oxygen readily, unites with new oxygen in the lungs to form oxyhæmoglobin again, and thus a fresh supply of oxygen is continually carried to the tissues. Hæmoglobin has the power of uniting with other gases besides oxygen. The most notable of these are carbon monoxid and *nitric* oxid. The affinity of carbon monoxid or of *nitric* oxid for the hæmoglobin is so great that when it comes in contact with oxyhæmoglobin, it drives out the oxygen and unites with the hæmoglobin itself. Hæmoglobin, thus united, cannot carry oxygen from the lungs to the system, so that gases which form such undecomposible compounds with hæmoglobin belong to the most dangerous of poisons. *Nitrous* oxid is positively not of this class. Under certain peculiar conditions it may form a compound with hæmoglobin, but this compound is not of the dangerous class referred to, nor are the conditions for its formation found in the body. There is no marked affinity between nitrous oxid and hæmoglobin as it exists in the blood. When brought freely in contact, no compound is formed. Even when all the oxygen has been removed from the blood by a gas-pump, nitrous oxid refuses to unite with the hæmoglobin. The same thing is demonstrated by its action on the system. A man who has been breathing coal-gas, in which carbon monoxid is the chief poisonous constituent, may die from slow asphyxia hours after he is brought into a healthy atmosphere, and the spectroscope will reveal in his blood the presence of carbon monoxid hæmoglobin. Within a few minutes after recovery from nitrous-oxid anesthesia, the most careful spectroscopic examination of the blood would never reveal that the patient had been breathing anything but normal air. The theory that *nitrous* oxid poisons in the way that *nitric* oxid or carbon monoxid does is thus positively refuted by both clinical experience and chemical analysis.

The widely accepted theory that nitrous oxid anesthetizes only by asphyxiating has more that may be said in its favor, or rather it has more to excuse it than the other two theories have, but a careful study will show that this theory also fails to put the case in its true light.

Any one who has seen patients anesthetized by nitrous oxid, and has observed the livid and ghastly expression which the face often assumes, cannot help being struck by the fact that in most cases there is a condition more or less of asphyxia ; but to say that it is *only* the asphyxia that produces anesthesia, or to say that the asphyxia must be pushed to the danger point before the patient is anesthetized, is going too far. How, then, is the anesthesia produced ?

Analysis shows that a given amount of blood absorbs just about as much nitrous oxid as the same amount of water would take up. We have seen that the nitrous oxid does not unite with the hæmoglobin, and we may say in a word that there is no other constituent of the blood for which it shows a special predilection. It is therefore fair to assume that the nitrous oxid is taken up in the lungs solely by the water of the blood, and is thus carried in simple solution to the tissues.

Asphyxia is produced not because nitrous oxid is present, but because oxygen in an available form is absent. After all the air is shut off and nitrous oxid is turned on, the system will run for a very brief time on what was in the blood and a slight reserve store in the tissues themselves, but when these supplies are exhausted the patient will succumb, unless fresh oxygen be admitted.

When nitrous oxid is breathed with sufficient air to prevent asphyxia, there is still enough of the sweet taste and intoxicating effect to convince any one that the gas is not inert, and if the cutaneous sensibility be examined it will be found to be blunted.*

If the gas were a more powerful anesthetic, or if it were more soluble in the blood, it could be given as ether or chloroform, mixed with enough air to meet all the demands of the system. In practice it is often given so as to exclude all air, and therefore produces asphyxia. The asphyxia then acts in conjunction with the true anesthetic properties of the gas to deepen the anesthesia; but this condition dare not be long maintained.

It is a law of physics that the greater the pressure of a gas on a liquid, the more of the gas will the liquid absorb. When a liquid is pressed upon by a mixture of gases, each individual gas exerts a pressure corresponding to its proportion in the mixture, and the liquid takes up more or less of any of the gases in proportion to the pressure which this gas exerts. At the atmospheric pressure the blood will take up enough nitrous oxid to anesthetize; but when we dilute the nitrous oxid with any considerable amount of air, the *partial pressure* of nitrous oxid in the mixture will not cause enough of it to be absorbed to produce this anesthesia. In accordance with this law of absorption in proportion to partial pressure, Paul Bert argued that if we cannot add enough nitrous oxid to the gas mixture breathed to make the blood take up sufficient nitrous oxid for anesthesia, we can accomplish the same purpose by increasing the total pressure at which the gas mixture comes in contact with the blood so that with the mixture of nitrous oxid and air the *partial* pressure of the nitrous oxid will be equal to its full pressure when given by itself at the ordinary atmospheric pressure. This should give nitrous oxid enough to anesthetize, and air enough for all demands of the system.

To produce this effect he had an air-tight cabinet constructed, into which patient, operator, and assistants could enter, and air was then pumped into this until the desired increase of pressure was obtained. The result of giving nitrous oxid mixed with air under these circumstances proved completely the correctness of his theory, and nitrous oxid was administered for serious operations of long duration, with perfect anesthesia and without the ordinary pallor attending complete anesthesia by nitrous oxid at the ordinary pressure.

Later he found that with due precaution he could admit enough air at the atmospheric pressure to sustain life without diminishing the partial pressure of the nitrous oxid so much as to prevent the absorption of sufficient nitrous oxid to produce anesthesia. In other words, with proper care he could keep a patient anesthetized without the use of his pneumatic cabinet by simply regulating the amount of air and of nitrous oxid breathed. Under these circumstances, he could avoid asphyxia of such a degree as to be dangerous.

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* It is interesting, from a historic standpoint, to note that the first intimation of the usefulness of nitrous oxid in dentistry was obtained from such a case. Mr. Cooley, a druggist, at one of Colton's demonstrations, while partially under the influence of nitrous oxid, and in a condition of excitement, knocked the skin off his leg, but felt no soreness. When he observed this, he is said to have made the remark, "I believe a person could have a tooth extracted and not feel any pain."

When anesthesia need only be maintained for a minute or less, it probably makes comparatively little difference whether air be admitted or not; but for longer anesthesia this is absolutely necessary. In the same way, if anesthesia is to be continued, the patient should never breathe the same air over and over, but some form of inhaler should be used which allows the expired air to pass out without resistance by one valve, and at the same time allows the proportion of nitrous oxid and air to be regulated by a separate arrangement, and the mixture to be drawn in without effort on the part of the patient.

Regarding the small supply of oxygen which suffices to keep the patient alive while anesthetized by nitrous oxid, I may mention, as one of the points held *sub judice*, that there is some ground for supposing that the metabolic activity of the tissues is diminished by the nitrous oxid, so that less oxygen is demanded than under ordinary circumstances. An analogous condition is found as a normal thing in hibernating animals.

Attention was next directed to the tracings with which this communication was illustrated. These tracings were taken on continuous paper in direct experiments on dogs. The blood-pressure and pulse were recorded by a mercury manometer, the respiration by a Marey tambour. Any change in the rate or force of the heart-beat, any rise or fall of blood-pressure, or any alteration in the rate or depth of the respiration, is shown in such a way as to strike the eye at once and be capable of measurement.

On these tracings were shown: (1) The effect of nitrous oxid when given without air so as to produce asphyxia; (2) The continuation of anesthesia without dangerous asphyxia when a small amount of air was admitted; (3) The difference between the action of nitrous oxid and of nitrogen when given pure and pushed to asphyxia and death. This contrast was striking, and showed how blunted the sensibility of the animal was when under nitrous oxid compared with nitrogen. It also showed that anesthesia was fairly well developed before asphyxia became marked; (4) The point at which artificial respiration (alternating pressure on the thorax) could be relied upon for resuscitation after respiration had stopped. In rapid anesthesia, of short duration, when the gas is pushed in its pure state, as is usual in dentistry, the heart continues to beat for some time after respiration has stopped, so that by adopting some efficient method of artificial respiration on a patient, there is always a good margin for resuscitation even if the anesthesia has been incautiously pushed too far. This was illustrated by tracings from experiments on animals.

In explaining the tracings, attention was called to the graphic record of the activity of the heart-regulating, vaso-motor, and respiratory centers, and the response of the centers to stimulation while the higher centers of consciousness were completely quiescent.

It has been taught by some writers that nitrous oxid has a baneful action on the kidneys. Both albuminuria and glycosuria have been ascribed directly to its influence. Many of the cases reported as illustrating this would have to be set aside as *not proven* so far as the responsibility of the nitrous oxid is concerned. The writer and Dr. Brush made some extended observations in this field on themselves, and as a result of the most careful examinations, no abnormality of the urine was detected after anesthesia by nitrous oxid. The writer had nitrous oxid administered to him nearly every day for a period extending over several weeks, but no albumen or sugar was found in the urine. In all cases of investigation of this character the condition of the subject of experimentation should be known, and control experiments should be made both before and after the administration of the gas and the examination of the urine. Reports of isolated cases here and there in which fabulous amounts of albumen or sugar were found in the urine are of little value in comparison with systematic investigation, including proper control experiments. The preponderance of evidence from this kind of work is that neither albumen nor sugar is found in the urine as the *direct effect* of nitrous oxid, after one long-continued anesthesia, or after repeated anesthetizations in a given period of time. That sugar might possibly occur in the urine after prolonged anesthesia by nitrous oxid is not impossible. We know that the drug curare has a marked effect in diminishing the control of the nervous system over the metabolic activity of the system with a transient glycosuria as the result, and if nitrous oxid should produce the same secondary effect, transitorily, it would not be surprising ; but this is a very different thing from saying that it produces diabetes. Carefully conducted researches on a number of cases would make a very acceptable addition to our knowledge on this point.

Nitrous oxid under pressure has been used in France for surgical operations of all degrees of severity, and later it has been used at the atmospheric pressure by simply exercising due care in admitting a certain amount of air with the gas. In Germany it has been used to some extent in obstetric practice, and also in surgery. In this country it has been used in very severe cases of surgery, notably by Dr. Brush, of Brooklyn, to whose interesting article on the subject I take pleasure in referring those interested. This article gives some account of Dr. Brush's large experience, together with suggestions as to its practical administration and the proper form of inhaler to be used. It is to be found in the *Brooklyn Medical Journal*, pages 289 to 298, May, 1890.

### *Discussion.*

Dr. S. C. Pennington, of Baltimore, spoke of a lady to whom he had administered nitrous oxid to extract two teeth ; she was in the eighth month of pregnancy. The effect upon her nervous system had been very severe, and she suffered severely afterward.

Dr. Kemp thought that the nervous system was affected because there was a generally prevalent belief that the use of gas would affect the patient in this way. If the administrator can gain the entire confidence of the patient, there will be little danger of ill after-effects.

Dr. Wm. A. Mills, of Baltimore, had been a victim of nitrous oxid. He formerly gave it with the same feeling of safety that he would a glass of water, but several times had had unpleasant experiences, and so concluded not to give it excepting where it was absolutely necessary. He knew by intuition when it was unsafe to let a patient have it. In one case he refused to administer the gas; the patient went to another dentist, and immediately after taking the gas she collapsed, and it took two hours' hard work to bring her to life again. He could not tell how he knew when it was not safe, but relied upon his own judgment, and when he felt it would be unsafe would absolutely refuse the gas.

Dr. PENNINGTON agreed with Dr. Kemp that absolute confidence was of greatest importance. In some cases his patients ask if they may bring their physicians with them. He is always glad to consent, as the presence of the physician imparts confidence and possibly saves trouble.

Dr. J. S. DORSEY, of Baltimore, asked Dr. Kemp which was the safest anesthetic.

Dr. KEMP said it would extend the session too long to discuss this question fully, but statistics have proved that nitrous oxid is infinitely the safest. The vast number of times it has been used and the very small number of deaths prove it to be almost absolutely safe. Of course, to one unaccustomed to the sight, the appearance of the patient is both distressing and alarming,—the death-like pallor is frightful. This is because the patient does not get enough oxygen to supply the blood. The administrator soon, however, gets accustomed to this, and the patient knows nothing of it, so it makes no difference.

Dr. W. DONNALLY asked whether nitrous oxid caused deposit of albuminous matter in the urine. He said no one could read what was published in the "American System of Dentistry" and other literature of the subject, without believing that nitrous oxid had a serious effect upon the kidneys. He thought to make its administration entirely safe, apparatus should be used that would admit of the admixture of a certain proportion of atmospheric air with the gas. Many of the best dentists seem to shrink from the use of nitrous oxid. He had come across a number of patients who believed their health had been seriously injured by the administration of the gas.

Dr. KEMP said the stories of the production of albumen in the urine seem like the logic of *post hoc ergo propter hoc*. No doubt the urine was found to be albuminous after the gas had been administered, but to his mind it was very doubtful whether the gas was in any degree a cause of the state. The question needs further investigation before it can be settled. He himself had taken the gas every day for weeks, and he knew of patients who had been kept under its influence for hours at a time with perfectly negative results.

A unanimous vote of thanks was tendered Dr. Kemp for his address, and the convention adjourned till the next day.

## SECOND DAY—*Morning Session.*

The convention was called to order at 10.30 A.M.; Dr. Elmer Wiber, of Washington, in the chair.

Dr. H. M. SCHOOLEY, chairman of the Committee on Crown- and Bridge-Work, offered as the report of his committee an address on "Scientific Root-Filling and Ideal Crown- and Bridge-Work," by Dr. NELSON T. SHIELDS, of New York.

Dr. SHIELDS described the method of preparing roots and making gold crowns as published in the DENTAL COSMOS in March and April, 1893. This, he said, was the ideal gold crown, but in his practice he had discarded it for the porcelain crown, inserted upon the same principles, as being nearer the ideal because it was more like the natural tooth.

Dr. G. H. CLAUDE said this was the first time he had ever heard advocated the method which he had long followed of filling the apex of the root with small particles of gold. He had had cases of teeth with abscesses which had been four or five years giving trouble, and his treatment was always successful. The canal must be filled promptly, as soon as cleaned out and sterilized. If the tooth will bear a temporary stopping for twenty-four hours, it will, filled properly, bear it for twenty years.

Dr. T. S. WATERS said he had been treating a tooth for six weeks and had not yet succeeded, and would like very much to have Dr. Claude cure it for him.

Dr. CLAUDE said he would accept the challenge, provided the tooth did not have a false opening through the root. In answer to an inquiry as to what the treatment would be, he said he would open the canal and clean it out and then dry it with bibulous paper, then place carbolic acid in and leave it for twelve hours, then clean it out again and fill with small pieces of soft gold quite up to the apex. Then he would fill the tooth, feeling quite sure there would be no further trouble.

Dr. WILLIAMS DONNALLY did not agree with Dr. Shields in pronouncing shell crowns an unmitigated evil. He had seen such which had done good service for years, and he had tested them for leaks unsuccessfully with the finest probes. Neither did he approve of devitalizing teeth in order to place crowns on them. He commended the method of making crowns described by Dr. Shields, and said that if the porcelain crowns can be made without breaking, it will be something few have accomplished before.

Dr. MARSHALL SMITH held that a shell crown skillfully and carefully made was a good piece of work, and one that he would not discard for anything. He had made them for ten years, and said that they could be made to fit properly.

Dr. WILLIAM A. MILLS commended the use of the porcelain crown on account of its likeness to the natural tooth. In all operations for restoration of the teeth, the nearer the approach to the appearance and form of the natural organ the more perfect the substitution. Porcelain allows the really skillful and careful dentist to restore the teeth without showing the artificial work, and therefore it is to be preferred wherever it can be used.

Dr. JOHN B. RICH said one important feature of Dr. Shields's address was the emphasis laid upon the necessity for careful and accurate work. This is the basis of all good dentistry. The fact often is made plain at these meetings, that as dentists we are not familiar with the literature of our profession. Both Dr. Maynard and himself he said were on record as having invented the method of filling the root-canal with pure gold. The instruments, material, and method are exactly the same as described to-day. All this was forty-five years ago, and the process had been described before conventions by himself time and again, and also by Dr. Maynard. He was anxious that the credit should not be taken from Dr. Maynard, though for himself he did not care.

Dr. SHIELDS, in closing the discussion, said he was glad to have heard from so many on the subject. Dr. Donnally said he had had good results from shell crowns. These crowns exactly reverse the law of nature, as the shell is larger at the neck than at the crown, and it must be driven up under the gum, making an unnatural appearance of the gum.

Dr. MARSHALL SMITH asked if there was any advantage in the porcelain crown with a platinum band over the shell crown in this respect.

Dr. SHIELDS said yes, as the band takes the place of the enamel on the root of the tooth the same as the gold band does in the gold crown described. Continuing, he said that dentistry to-day is in the height of its greatest error, because of shell crowns. They are used because the dentist can get fifteen dollars each for them, and they can be made in a few minutes at a cost comparatively trifling. He could make a crown in forty minutes, and the materials would not cost more than seventy-five cents. He had never had a porcelain crown to crack; but, if it should, it would of course have to be taken off. They should be so strong that they will not break. He congratulated Dr. Rich from the bottom of his heart upon having originated this method of canal-filling; but, till he knew the Donaldson instrument, he never could get an instrument with which the canals could be filled properly.

The discussion was closed, and, in accordance with suggestions made by the committee to whom the president's address was referred, the two associations resolved to meet in joint convention in Washington in 1896. Also resolved that the secretary memorialize the American Dental Association and the Southern Dental Association in favor of the National Dental Library and Museum.

On motion, the convention adjourned till 2.30 P.M.

(To be continued.)

## AMERICAN MEDICAL ASSOCIATION—SECTION ON ORAL AND DENTAL SURGERY.

(Continued from page 714.)

### THIRD DAY—*Morning Session.*

THE section was called to order by the chairman at 10.30 A.M.

The following papers were read, of which we give abstracts.

The first was by Dr. J. G. HEUISLER, of Baltimore, Md., entitled,—

### THE DESTRUCTION OF CHILDREN'S TEETH, THE CAUSE AND REMEDY.

The author called attention to the widespread destruction and loss of children's teeth, due to neglect and ignorance as to the proper time and means for caring for the teeth. He said that the ignorance of parents and guardians with respect to this important matter was almost general. He had found but few in his experience who realized the importance of the first permanent molar, the common belief being that it is a deciduous tooth. This ignorance is not confined to a few of the poor, but extends to others who have time and means at their command, but who never think of their children's teeth until they are crying with the pain of toothache; or perhaps they may do all they consider necessary by insisting upon the use of the tooth-brush and dentifrices, but never consult a dentist as long as the child does not complain.

Another potent factor in the loss of children's teeth is the use of improper foods, especially the use of bread and pastry made from double-bolted flour, whereby an insufficient amount of phosphates and bone-making material is furnished to the child. He suggests to his patients the use of corn bread and bran bread, and also prescribes syrup of hypophosphites as an effort to check and restore the loss of the lime-salts of the teeth.

Physicians should realize more fully the importance of examining the teeth of children. They usually have an earlier opportunity to make such examinations than the family dentist. No physician who has the welfare of his patients at heart can afford to neglect a consideration of their teeth. It is not expected that a physician should perform dental operations, but he can at least examine the teeth of children, and where he recognizes the need for treatment insist upon the parents taking them to some careful dentist.

The obligation upon the physician's part for the conscientious supervisory care of the teeth is as great as that for the care of the nose, eye, or ear. We should, as dentists, recognize it as our duty to in the first place educate our patients. This may be accomplished by the publication of a small tract or leaflet, written in plain, simple language, so that any one can understand it, describing the order of eruption of the permanent teeth, proper means of caring for them, and warning parents of the necessity of preserving the temporary teeth until the permanent teeth appear. Such a pamphlet, issued under the auspices of the American Dental Association or the National Association of Dental Faculties, could be given to our patients, and in this manner great good could be accomplished. Or a series of short articles upon the care of the teeth could be written in such a manner as to interest and at the same time instruct the children as to the necessity of taking care of their teeth. These articles might be published in juvenile papers. Of course, whatever is to be published should be done with the sanction of some recognized medical or dental association, to remove from it every semblance of quackery or advertising.

The next paper was by Dr. T. S. WATERS, of Baltimore, Md., entitled,—

### THE PUBLIC SCHOOL AND ITS EFFECTS.

The author dealt at length with certain defects in our public school system and methods in relation to health, calling attention to the pathological effects of the high-pressure system of education upon the teeth, due to overworking the brain without a proper amount of physical development in the open air to counteract the loss of nervous force. He dwelt upon the importance of arousing discussion upon these topics through the daily press, that a public sentiment might be formed which will cause a reaction in the matter, and the heads of our educational institutions be made to halt and modify a system of teaching which has proved for a quarter of a century so very deleterious to the physical and mental growth of our generation. The system of crowding and cramming in schools impairs the health and lessens the appetite, causing imperfect nutrition, bad assimilation of food and of ideas, reacting unfavorably upon the growing child, retarding and impairing the development of the second growth of teeth. The effects of this imperfect educational system become manifest in the rachitic conditions affecting the teeth and bones in nervous exhaustion, neurasthenia, chlorosis, chorea, etc.

In addition to the unhygienic conditions caused by overcrowding the school-rooms, is the increased danger of panic, and its fatal results in case of fire. There should be a return to the primitive form of the country school. Every precinct in each ward of our city should have a reproduction of one-story buildings and plenty of fresh water and air. The interior containing study, class and teacher's room, suitable to accommodate seventy-five to one hundred pupils, with twenty-five to fifty scholars to the teacher and assistant, with direct light from four sides and ventilation from every direction. While the expense would be greater, it would be compensated for by the superior results in the improvement and education of our children, both mentally and physically, for the benefit of the nation.

The moral obligation of every true physician and dentist should prompt him to act speedily and forcibly in this matter, and join forces with the great sanitarians, for the time is propitious, and if we fail to meet the emergencies we are unworthy members of the great healing art which prevents as well as rectifies disease.

### *Discussion.*

Dr. M. H. FLETCHER, of Cincinnati, said the importance of the subjects treated of in the two papers was second to none ever brought before a society, as they bear directly upon the proper development of the teeth and the health and strength of the whole body. It is a lamentable fact that too little attention is given to the hygienic surroundings of the pupils in the schools, and by far too little to the nature of the food and the manner of eating. The aim often seems to be to so prepare the food that it will require little or no mastication before it is swallowed, and when solid food is taken it is not sufficiently masticated to properly prepare it for the digestive organs. Some years ago he had requested many of his patients for reports as to the number of bites it required to masticate different foods. He especially desired to learn how much less children chewed the food before swallowing it than their parents. He got reports from one hundred and fifty intelligent people, and learned that practice in this regard varies very much, and that children generally were entirely too apt to bolt their food. To encourage the habit of chewing it more thoroughly he had advised parents to give the children chewing-gum, much to the disgust of many of the parents. He thought the habit of swallowing food before it was properly masticated the cause of insufficient nourishment in many cases.

Dr. W. X. SUDDUTH, of Minneapolis, said that our discussions were too apt to be from our own standpoint, as, of course, each one spoke of things as they were seen in his own locality. There is a portion of the United States where all these hygienic points are observed. It is in the state of California. There the children are brought up largely out of doors, with more freedom to indulge their natural love of exercise and play than they have in the older communities, and, in consequence, they are healthy, hearty, and cheerful, and have good teeth. That such a life is not conducive to the highest intellectuality goes without question; but we will all admit that a perfect healthy animal life is to be preferred to intellectuality. He bespoke for general education a more rational treatment; the physical well-being should be cared for even more conscientiously than the mental growth. This is coming to be the rule at our universities now, and more and more thought is being given to the development of the body.

The faulty conditions in our schools are a result of the advancing demands of the higher civilization of the age. The number demanding education exceeds the financial ability of the communities to handle them properly, and so they are crowded together without sufficient space or ventilation, and crammed with lessons, that they may be the sooner educated and get through with their studies, to make room for those who are clamoring for their places. As teachers, as physicians, as citizens, we should make every effort to correct these faults; we should insist upon properly lighted and well ventilated school rooms; and one other important point we should insist upon,—breathing spaces, such as spacious playgrounds near the schools. The effect of the deprivation of these things is recorded upon the teeth of our patients, and as dentists we have a right to be heard in the matter.

Dr. J. L. WILLIAMS, of Boston, said the papers under discussion pointed out a wide field in which the dentist could do good work, and he had a duty to perform in the way of pointing out the evil effects of confinement, over-stimulation of the brain, and bad ventilation, and their influence upon the teeth.

Dr. R. R. ANDREWS spoke of the effect of confinement and the eating of cooked food as shown upon the teeth of dogs, and said that in the city of New York there was at least one dog dentist, or rather a dentist who confined his practice to the teeth of dogs, who testified that among the petted canine darlings of the wealthy the teeth are in frequent need of attention.

Dr. E. S. TALBOT said to escape the defects and irregularities in teeth we would have to go back farther than the school-house, we would have to go far enough back to regulate marriages. The intermarriage of different races in this country is producing a country of degenerates. His observation has taught him that over fifty per cent. of all the people in this country bear some marks of degeneracy; by the word degeneracy he means a departure from the normal, not necessarily that these people are less able to live useful lives than those who are entirely normal, but in certain features they show the absence of full development. This percentage is much greater than in any European country. When two such degenerates marry, the offspring will show the same condition exaggerated. The want of proper care of the mother during gestation also has a serious effect upon the development of the child, as without proper nourishment the child cannot be properly supplied. Thus we are raising in this country a community of degenerates, and no matter how much we improve our schools and their surroundings, we cannot remedy the evil, for we cannot go far enough back.

Dr. HEUISLER spoke of the difficulty as to just what to advise parents as to proper foods and care of the teeth of children.

Dr. WILLIAM S. SHERMAN, of Newport, R. I., said it was an easy matter to advise parents, but difficult to get them to carry out the advice given. In many cases they are hindered by circumstances. They cannot afford the money nor the time needed to carry out the suggestions. The desire to save teeth he thought was going to an extreme with dentists. In many cases patients cannot or will not pay for the treatment necessary to save teeth of poor construction, and it would be better to extract such teeth.

Dr. WATERS said that much of the degeneracy of which Dr. Talbot spoke was due to the drain on the vitality of the children during school life. Children enter the high schools about the time they reach the most critical period of growth, the period of adolescence, when they need the greatest possible care, missing which they may receive injury which will be reflected not only in their own later lives, but in their offspring as well.

(To be continued.)

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## HARVARD DENTAL ALUMNI ASSOCIATION.

THE twenty-fourth annual banquet of the Harvard Dental Alumni Association was held at the "Thorndike," in Boston, on June 24, 1895, with sixty-three members and guests present.

The invited guests were Charles Francis Adams, LL.D., Hon. Sherman Hoar, U. S. District Attorney; M. C. Ayres, editor Boston *Advertiser;* Rev. A. E. Winship, editor *Journal of Education;* Victor J. Loring, LL.B., and William M. Conant, Instructor in Anatomy, Harvard Medical School; all of Boston.

Two corresponding secretaries from Berlin, Germany, were present, Drs. Charles H. Abbot and Amos I. Hadley.

President Clapp, in a happy vein, introduced the guests, all of whom improved the opportunity to do themselves credit by making excellent speeches.

Hon. Sherman Hoar, after much wit, claimed the right for all the professional schools of Harvard University to vote for overseers, saying, "Now, Harvard College controls Harvard University, but Harvard University ought to control Harvard University."

Owing to the absence of Dean Chandler, due to a long and serious illness, Professor Fillebrown described the work and progress of the school during the past year, stating that the entrance examination in '97 would make either Latin or French obligatory, in addition to the present requirements.

The reports of the various officers were made earlier in the evening.

The following named officers were elected for the ensuing year:

James Shepherd, D.M.D., president; Frank Perrin, D.M.D., vice-president; Waldo E. Boardman, D.M.D., secretary; Washburn E. Page, D.M.D., treasurer; Waldo E. Boardman, D.M.D., chairman, William P. Cooke, D.M.D., Patrick W. Moriarty, D.M.D., executive committee.

WALDO E. BOARDMAN, D.M.D., *Secretary.*

## MONTANA STATE DENTAL ASSOCIATION.

THE Montana State Dental Association was organized in Helena, July 26, 1895, with the following officers: Dr. J. W. Reed, Butte, president; Dr. C. H. Head, Helena, first vice-president; Dr. R. M. Leslie, Livingstone, second vice-president; Dr. C. S. Lewis, Butte, corresponding secretary; Dr. F. B. Norris, Helena, recording secretary; Dr. T. M. Hampton, White Sulphur Springs, treasurer; Dr. W. H. Hall, Butte, Dr. S. I. Stone, Helena, Dr. D. J. Wait, Helena, executive committee; Dr. S. C. Pierce, Livingstone, Dr. C. L. Bishop, Helena, Dr. P. F. Griselle, Helena, board of censors; Dr. F. B. Norris, Helena, Dr. C. G. Dodge, Helena, Dr. A. E. Kromer, Helena, committee on publication; Dr. D. J. Wait, Helena, Dr. W. H. Hall, Butte, Dr. P. F. Griselle, Helena, committee on ethics; Dr. J. W. Reed, Butte, supervisor of clinics.

The next annual meeting takes place at Butte, the last Thursday in July, 1896.

F. B. NORRIS, *Recording Secretary*,
Helena, Mont.

## NEBRASKA STATE DENTAL SOCIETY.

AT the nineteenth annual meeting of the Nebraska State Dental Society, held at Norfolk, May 21 to 24, 1895, the following officers were elected for the ensuing year: Dr. J. S. McCleery, Beatrice, president; Dr. D. M. Huestis, Nebraska City, vice-president; Dr. T. I. Hatfield, York, recording secretary; Dr. W. H. Latey, Omaha, corresponding secretary; Dr. H. J. Cole, Norfolk, treasurer.

W. H. LATEY, *Corresponding Secretary.*

# DENTAL COLLEGE COMMENCEMENTS.

## UNIVERSITY OF MICHIGAN—DENTAL DEPARTMENT.

THE annual commencement exercises of the College of Dental Surgery of the University of Michigan were held, in connection with those of the other departments of the university, at Ann Arbor, Mich., on Thursday, June 27, 1895.

The commencement oration was delivered by James Hulme Canfield, LL.D.

The number of matriculates for the session was one hundred and eighty-five.

The degree of D.D.S. was conferred on the following graduates:

| NAME. | STATE OR COUNTRY. |
|---|---|
| Douglas Anderson | England. |
| Archibald E. Ball | Michigan. |
| Amos Barnes | Michigan. |
| Orville M. Barton | Michigan. |
| Alfred L. Beatie | Oregon. |
| Joseph H. Billmeyer, Jr | Michigan. |
| Joseph A. Bucknall | England. |
| Fred C. Clapp | Michigan. |
| Lewis E. Coonradt | Illinois. |
| Mary B. Crans, B.S | N. Dakota. |
| Fred E. Dodge | California. |
| John B. Dowdigan | Michigan. |
| Edm'd Dubuis, D.E.D.G | Switzerl'd |
| Walter G. Dunham | Michigan. |
| George F. Fiddyment | Illinois. |
| Van Camp Garratt, D.D.S | Michigan. |
| Fred P. Graves | Michigan. |
| Arche G. Hicks | Iowa. |
| Harry B. Hinman | Michigan. |
| Marshal L. Howver | Illinois. |
| Arthur S. Kennedy | Iowa. |
| John F. H. Kuyper | Holland. |
| Walter A. Lampman | Michigan. |
| Harry H. Lauderdale | New York. |
| Albert L. LeGros | California. |
| William G. Lentz | Michigan. |
| Frank E. McLaughlin | Ohio. |
| Joseph Merckens | Germany. |
| Daniel Merner | Iowa. |
| John H. Neeley | Ohio. |
| George A. Parmenter | Michigan. |
| Clarence F. Piper | Canada. |
| H. B. Respinger, D.E.D.G | Switzerl'd |
| Burt T. Ruthruff | Michigan. |
| Francis F. Scott | Michigan. |
| Newton J. Smith, Jr | Illinois. |
| Charles B. M. Southwick | Michigan. |
| Joseph H. Stromier | Scotland. |
| Clifford P. Sweny | Ohio. |
| Andrew R. Thorpe, A.B | California. |
| Christian L. Theurer | Wisconsin |
| George M. Tyng | Texas. |
| Perley T. Van Ornum | Wisconsin |
| Elizabeth von Bremen | Germany. |
| Friedrich von Widekind | Germany. |

The degree of Doctor of Dental Science was conferred on Will Hamilton Van Deman, D.D.S., and Charles Traver Whinery, D.D.S., both of Ohio.

## HARVARD DENTAL SCHOOL.

The annual commencement exercises of the Harvard Dental School took place, in connection with those of the other schools of Harvard University, at Boston, Mass., on Wednesday morning, June 26, 1895.

The number of matriculates for the session was eighty.

The degree of D.M.D. was conferred on the following graduates by Charles W. Eliot, LL.D., president of the university:

| NAME. | STATE OR COUNTRY. |
|---|---|
| Ernst S. Arvedson | Sweden. |
| Edward D. Barrows | Maine. |
| Robert L. Bartlett | Massachusetts. |
| Clarence A. Carr | Rhode Island. |
| Walter S. Coleman | Maine. |
| Dwight W. Dickinson | Massachusetts. |
| Percy Edgelow | England. |
| James A. Furfey | Massachusetts. |
| Marquis Littig | Iowa. |
| Frederick E. Meade | New Hampshire. |
| Richard D. Milliken | Maine. |
| Robert T. Moffatt | Massachusetts. |
| Henry C. O'Brien | Massachusetts. |
| Patrick H. O'Connor | California. |
| Francis W. Rice | Maine. |
| Leopold Scheuermann | Germany. |
| Arthur H. Woodcock | Rhode Island. |

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# DENTAL SOCIETY ANNOUNCEMENTS.

## FIRST DISTRICT DENTAL SOCIETY OF ILLINOIS.

THE First District Dental Society of Illinois will hold its annual meeting at Canton, Ill., September 10, 11, and 12, 1895. An interesting program has been prepared.

W. A. JOHNSTON, Peoria, *President.*
W. O. BUTLER, La Harpe, *Secretary.*

## SOUTHERN DENTAL ASSOCIATION.

THE annual meeting of the Southern Dental Association will be held in Atlanta, Ga., beginning on Tuesday, November 5, 1895. Arrangements are being made for the greatest meeting in the history of the "Southern." The Cotton States and International Exposition will be in progress, and railroad rates will be very low. All friends will be given a hearty welcome.

The following changes in the committees have been made by the president:

Master of Clinics, Dr. Lewis P. Dotterer, of Charleston, S. C., in place of Dr. S. B. Cook; Assistant and Secretary of Clinics, Dr. T. P. Hinman, of Atlanta, Ga.; on Committee on Pathology and Therapeutics, Dr. J. C. Storey, of Dallas, Texas, in place of Dr. T. P. Hinman.

E. P. BEADLES, *Cor. Secretary.*

## NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

THE newly elected officers are: John T. Abbott, D.D.S., Manchester, Iowa, president; W. H. Noble, Washington, D. C., vice-president; Charles A. Meeker, 29 Fulton street, Newark, N. J., secretary and treasurer.

The secretaries and members of state boards throughout the United States and territories will greatly assist in the work of the association by forwarding to the secretary members' names and residences.

CHARLES A. MEEKER, D.D.S., *Secretary,*
29 Fulton street, Newark, N. J.

## NEW JERSEY STATE DENTAL SOCIETY.

THE officers for 1895–96 are as follows: R. M. Sanger, East Orange, president; Harvey Iredell, New Brunswick, vice-president; Charles A. Meeker, Newark, secretary; Geo. C. Brown, Elizabeth, treasurer; S. C. G. Watkins, Montclair, Oscar Adelberg, Elizabeth, Wm. E. Truex, Freehold, Wm. P. Richards, Orange, executive committee; J. Allen Osmun, Newark, J. L. Crater, Orange, Walter Woolsey, Elizabeth, F. Edsall Riley, Newark, H. S. Sutphen, Newark, membership committee.

CHARLES A. MEEKER, *Secretary,*
29 Fulton street, Newark, N. J.

## DENTAL SOCIETY OF SOUTHWESTERN MICHIGAN.

THE semi-annual meeting of the Dental Society of Southwestern Michigan will be held at St. Joseph, October 8 and 9, 1895. A good program has been arranged, and a very instructive and interesting meeting is expected.

For further information or copies of program address S. M. White, D.D.S., Benton Harbor, or E. I. Backus, D.D.S., St. Joseph, Mich.

All dentists in Michigan and adjoining states are cordially invited.

S. M. WHITE, *Chairman.*
E. I. BACKUS, *Secretary.*

## MINNESOTA STATE DENTAL ASSOCIATION.

THE Minnesota State Dental Association will hold its annual meeting in St. Paul, September 11, 12, and 13, 1895. The executive committee has arranged an interesting program. A cordial invitation is extended to the profession in this and other states. H. L. CRUTTENDEN, *Secretary*,
Northfield, Minn.

## ILLINOIS BOARD OF DENTAL EXAMINERS.

THE annual meeting of the Illinois State Board of Dental Examiners will be held in Springfield, on Tuesday, September 24, 1895. Candidates for examination will at once notify the secretary of their intention of being present.
L. L. DAVIS, *Secretary*.

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# EDITORIAL.

## THE AMERICAN DENTAL ASSOCIATION MEETING.

THE developmental impulse in dentistry is distinctly evolutional; its growth proceeds through the working out of forces which are brought into active operation as the result of the ever-increasing complexity of our social organization. As civilization has presented more and more exacting conditions of development in all of our social relationships, the growth of dentistry has been stimulated accordingly to keep pace therewith. The various stages of dental growth seem each to have had a distinctive motive or factor which has been characteristic of the development of that period. The past decade, for example, has witnessed decided advances in both the science and art of dentistry. Our knowledge of etiology, pathology, and therapeutics, has advanced, and improvement of operative procedures and technique has been most marked. A natural result of activity along these lines has been the acquirement of a vast amount of valuable material in the shape of data which has to be incorporated and assimilated as a necessary part of the working equipment of the practitioner. That it shall be so incorporated and assimilated implies and necessitates a higher standard of dental educational requirement, and for the accomplishment of that end a better and more thorough system of dental instruction has become necessary.

Finally, and as a direct result of the conditions stated, a readjustment of our legislative features regulating and maintaining our professional standards has become an immanent necessity. It is these features which characterize our present stage of development.

The work of our national body at its meeting just passed has been notable, by virtue of the prominence of the factors here alluded to.

Taken as a whole, in view of the total output of work, both as to quantity and character, the meeting must be regarded as a decided success. The activities which are most prominently at work in shaping the growth of dentistry in the United States were strongly reflected in the proceedings of this meeting of the association, giving practical evidence of the importance of our great national body as an exponent and representative of the whole dental profession of this country.

The scientific value of a number of the papers read before the association was of a high order, and they will constitute a definite addition to our knowledge. Especial mention should be made of the work of the section on Anatomy, Pathology, and Surgery. The results of Dr. Cryer's original research into the anatomy of the maxillary bones must compel a revolution in much of our previously received teaching in that department.

The tendency toward unification of standard in dental legislation and toward a similar end in dental education, which has been manifested for some years past throughout the United States, found emphatic expression in the collateral work of the association,—*i.e.*, in the deliberations of the National Association of Dental Examiners and the National Association of Dental Faculties. This tendency is not simply a growing sentiment ; there has been an expressed desire on the part of the dental profession to achieve uniformity in these matters through all the states. The great obstacle to absolute uniformity in legislation in this country is the autonomy of the states. Legislation with regard to dentistry comes under the state police powers, which are guaranteed to them as an individual right by the constitution of the United States. The enactment of a national law creating a uniform standard would, therefore, be clearly unconstitutional. The only possible means for securing the end in view has been by the creation of a strong moral sentiment in favor of uniform standards, and that has been largely an outcome of the work of the Faculties and Examiners Associations. By this means they are continually reaching out toward a harmonization of the several state standards upon a higher plane with respect to the two important factors of dental progress,—education and legislation,—and gaining such strength and solidity of position that in the course of time, if indeed it is not already true, the lack of constitutional legal authority will cease to be of any practical moment.

Independently of the distinct advance along legislative lines, has occurred a rapid and substantial growth in dental educational methods, comprehended in what is known as the technic system. Three years ago a few enthusiastic teachers who had, from investigation and practical experience in the workings of the technic system, realized its great value, met together and organized the National

School of Dental Technics, the youngest and perhaps the most interesting offshoot of the educational phase of our evolution. Its purpose is the increase and spread of the sphere of usefulness of the system, and the securing of an opportunity for the interchange of ideas and experiences in its development and practical application. The National School is made up of delegates from those colleges in which the system is installed. At its incipiency eleven colleges were represented; at the time of the late meeting its membership was increased to twenty-nine. The proceedings consisted of an exhibit of the work done in the application of the technic method to various departments of dental education, and the discussion of ways and means for its further development and betterment in the practical work of teaching. So rapid has been the growth of this system and so general has been its acceptance that the results were to many a revelation. It is quite evident that an entire revolution in our classical methods of dental education is near at hand.

That the technic system is based upon correct psychological principles cannot be questioned; and no one can doubt that where the system is intelligently applied, its value in improving the educational equipment of the student is far beyond anything heretofore accomplished in that direction. A correct appreciation of the principles upon which it is based is, however, essential to its successful application. A source of danger affecting its efficiency may easily arise from a misconception of just what is intended to be achieved by the technic system,—that is to say, in regarding it merely as a system of manual training. It is a manual-training method, but its distinctive trait is not a training of the hand, but a training of the brain through the perceptive faculties, the most prominent of which in this connection being that of touch, has led to its being designated as a manual-training method. Now, according to the way in which this system is regarded by the teacher, is it likely to result in success or failure? If it is regarded simply as a manual-training means, there is grave danger that a multiplicity of details and methods will be introduced for hand-training having but little value in systematically directing the brain in the desired path, leading to confusion and waste of force, and thus failing to produce an adequate educational result. If, on the other hand, it is thoroughly recognized that the technic system is a valuable method for intellectual cultivation and training, it will furnish to the work of the Faculties Association a great and valuable pedagogical motive, second only, if not equal in importance, to its legislative function. That the National School of Dental Technics should ultimately become an integral part of the Faculties Association, or at least closely correlated with it, would seem desirable. While the function of the Faculties Association is educational, it concerns itself principally with the judicial and legislative factors of the educational problem. If these two could be harmoniously correlated with the pedagogical factor alluded to, much good would naturally flow out of their co-operative efforts toward their common end and purpose,—the betterment of our educational standards.

## SIR JOHN TOMES, F.R.C.S., F.R.S., L.D.S.

THE world of dentistry will learn with deep regret of the death of Sir John Tomes, which occurred at his house in Caterham Valley, Surrey, England, July 29. Easily the foremost figure in the development of the science and art of dentistry in the United Kingdom from about 1845 to the time of his retirement a few years since, John Tomes was one of the great leaders in the progress of modern dental evolution. His name is inscribed indelibly upon its history. An account of his life and services will appear in a later number of the DENTAL COSMOS.

## BIBLIOGRAPHICAL.

METHODEN UND NEUERUNGEN AUF DEM GEBIETE DER ZAHNHEILKUNDE. Von WILH. HERBST, Dr. hon. causa (Ohio Dental College). Verlag Odontologische Verlagsanstalt, Berlin, Germany.

Dr. Herbst, in this volume of about three hundred pages, sets forth the methods which he has devised and found useful in the conduct of his practice.

It is doubtful if the book has a counterpart; it certainly stands alone in dental literature. It is an agglomeration of a great mass of matter which has not the slightest element of continuity.

In an arrangement much like that of a cook-book, the author has collected and given in detail the various "wrinkles," methods, devices, etc., which his ingenuity has created to overcome the difficulties of practice.

It is intensely individual in character, and, as an exhibit of the singular flexibility of resource which characterizes the author, it is most interesting.

It is not in any sense a scientific book. The author's famous cobalt method for treating exposed pulps is given at length, but the cobalt now figures under its correct Latin name, as *arsenicum metallicum crudum*. From the description given we are led to infer that Dr. Bödecker is favorable to this procedure as a general method for pulp-treatment, which is quite contrary to, at least, the later opinions held by that gentleman, as expressed in his work on Dental Pathology, in which he holds a very conservative position regarding it.

As a compendium of the contributions of Dr. Herbst to practical dentistry the work is of interest, and it will have a value in so far as it may be a help and stimulus to others to overcome obstacles as they occur without waiting for outside help.

USEFUL HINTS FOR THE BUSY DENTIST. By W. H. STEELE, D.D.S. Vol. II, pp. 286 and index. Price, cloth, postpaid, $2.50. Philadelphia: The Wilmington Dental Mfg. Co., 1895.

The character of this book is clearly indicated by its title. The first volume received favorable notice in this journal at the time of its appearance. The present volume is an improvement upon its predecessor, because of the free use of illustrations made in it.

Books of this description have a considerable usefulness for reference, and because of their suggestiveness. They often render a service worth many times their cost in helping the busy practitioner over some of the difficulties in his work, at times when such help is most needed.

L'ARTICULATION ALVEOLO-DENTAIRE CHEZ L'HOMME. Par EDOUARD BELTRAMI, Docteur en Médecine et Chirurgien, Dentiste de la Faculté de Paris, etc. Paris, J. B. Bailliere et Fils, 1895.

As indicated by its title, this work is an exhaustive research with respect to the articulation of the human teeth, with their alveolar sockets. This includes a study of the anatomy, both gross and minute, of the tissues concerned in the articulation; the mechanics of the joint; a historical presentation of the views held concerning it, and a very full bibliography of writers upon the subject. The book is marred by the occurrence of many typographical errors, which would have been eliminated by careful proof-reading. In its essential features it is a valuable contribution to the literature of the subject, and a welcome addition to our list of dental works.

KRONEN- UND BRÜCKEN- ARBEITEN. Ein Lehrbuch von HANS RIEGNER, Dr. chir. dent., Zahnarzt in Breslau. Erste Hälfte, Kronen-Arbeiten, mit 266 Illustrationen. Leipzig, Verlag von Arthur Felix, 1895.

This work, so far as can be determined by the first volume, is a very creditable exposition, in German, of methods for the construction of crown- and bridge-work which have all, without exception, been fully set forth in American treatises and text-books dealing with the subject. The work is almost wholly a compilation, which is nevertheless admirably done, and will no doubt aid much in familiarizing our German colleagues with the crown- and bridge-work procedures in vogue in this country. The typography, paper, and press-work are excellent.

### PAMPHLETS RECEIVED.

Transactions of the New York Academy of Medicine. Second series, vol. x. For 1893. Printed for the Academy, 1894.

Proceedings of the Academy of Natural Sciences of Philadelphia. Part I, January–March, 1895.

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# OBITUARY.

## DR. HENRY H. FITCH.

DIED, in Pekin, Ill., May 2, 1895, of rheumatism of the heart, Dr. HENRY HOWARD FITCH, in the fiftieth year of his age.

Dr. Fitch was born at Mooers, Clinton county, N. Y., April 10, 1846. His parents removing to Thetford, Vermont, Dr. Fitch was educated at the Thetford Hill Academy, and in 1867 entered Dartmouth College, where he completed his education. He commenced the practice of dentistry with Dr. Boynton, in Lisbon, N. H., but in 1869 went to Lee, Mass., where he established an independent practice. In 1876 he went to Pekin, Ill., where he successfully followed his profession of dental surgeon from that year up to the time of his decease.

In July, 1871, Dr. Fitch was married to Mrs. Mary L. Beach, at Lee, Mass., who survives him with two daughters. He had the reputation of being a loving husband, an indulgent father, a courteous gentleman, and a good citizen.

## DR. G. B. GARRISON.

DIED, at Ellenville, N. Y., May 6, 1895, of angina pectoris, Dr. GOLDSBORO B. GARRISON, in the fifty-first year of his age.

Dr. Garrison was born at Scranton, Pa., August 19, 1844. His dental pupilage was passed with Dr. P. L. Garrison, of Newton, N. J., and he commenced practice there in 1867, but for many years had been a leading dentist at Ellenville, N. Y., up to the time of his decease.

Dr. Garrison was a prominent Grand Army man, having served in the late war of the Rebellion as major on General Custer's staff. He was married at Albany, N. Y., in 1878, to his second cousin, Miss Susan Garrison, who survives him.

## DR. CYRUS W. CROSS.

DIED, at Palmer, Mass., June 25, 1895, of stomach and kidney disease, Dr. CYRUS WESLEY CROSS, in the fifty-fourth year of his age.

Dr. Cross was born at Monson, Mass., April 10, 1842. His parents removed to Worcester, to Boston, and finally to Wilbraham. He was educated at the Wesleyan Academy, and in 1862 enlisted in the army, and served during three years of the Rebellion in the Thirty-seventh Massachusetts Volunteers. He was in many battles, including those of Fredericksburg, Gettysburg, and Cedar Creek. At the close of the war he went back to Wilbraham, and commenced the study of dentistry with Dr. Gould, at Palmer. After mastering his profession, he opened an office in Wilbraham, where he remained until 1870, when he removed to Palmer, where he continued in practice up to the time of his death.

Dr. Cross was twice married,—first, in 1866, to Miss Anna Cooley, of Palmer, who died in 1873; secondly, in 1875, to Miss Charlotte E. Kent, of Wilbraham, who survives him. There also survive him one son by his first wife, and one son and two daughters by his second wife. The doctor was a prominent Mason, and a member of several other orders. He was popular among members of the Grand Army, was a consistent member of the Congregational Church, and was held in high esteem as a citizen.

## DR. AUGUSTUS W. BROWN.

Died, July 5, 1895, at his summer residence in Manchester, Vt., Augustus Woodruff Brown, D.D.S., aged ninety years.

Dr. Brown was born in Litchfield, Conn., and was the oldest dentist in America at the time of his death. He practiced in New York city for over half a century, and retired fifteen years ago with a fortune. He was at first associated with Dr. Solyman Brown, his oldest brother, whose name is one of the best known in early dental literature. In their office in Park Place, New York city, the first dental society in the world was organized, and the first dental journal originated. These were, respectively, the American Society of Dental Surgeons, of which Dr. Eleazar Parmly was first president, and the *American Journal of Dental Science*, of which Dr. Solyman Brown was first editor.

Dr. Augustus W. Brown at one time had the most aristocratic and lucrative practice in New York, and was widely known in social as well as professional circles. One of the earliest honorary degrees of the Baltimore College of Dental Surgery was conferred upon him.

He married Miss Emma Mandeville, who survives him, together with two daughters. He had nine children, but none of the sons survived to manhood.

The funeral services were held at Manchester, and the interment was in the family vault in old Marble Cemetery, in New York city.

## DR. CHARLES H. SCRUTON.

Died, at Rochester, N. H., August 9, 1895, of appendicitis, Charles Herbert Scruton, D.D.S., in the twenty-ninth year of his age.

Dr. Scruton was born at Rochester, N. H., April 21, 1866. He commenced the study of dentistry about 1891, with Dr. F. H. Lunt, and subsequently entered the Philadelphia Dental College, whence he graduated with the class of 1895. Immediately after graduation he returned to his native place and entered practice with Dr. Lunt, which continued with much promise up to the time of his decease. He was a member of Humane Lodge of the Order of Masons, and was unmarried.

## DR. CHARLES H. JOHNQUEST.

DIED, at Somerville, Mass., June 28, 1895, of consumption, Dr. CHARLES H. JOHNQUEST, in the thirty-second year of his age.

Dr. Johnquest was born at Somerville, Mass., October 5, 1863. He commenced his dental pupilage about 1882, with Dr. J. S. Flagg, of Cambridge, and subsequently studied one year at the Boston Dental College. In 1885 he entered practice in Boston with Dr. E. S. Taylor; was subsequently with Dr. H. D. Osgood; then at Concord; then with Dr. H. D. Osgood, where he remained.

Dr. Johnquest was married in October, 1888, to Miss Florence H. Osgood, at Somerville. His wife survives him, with two young daughters, aged respectively three and five years.

## DR. FRED. H. WOODCOCK.

DIED, in Boston, Mass., June 27, 1895, of paralysis of the heart, FRED. H. WOODCOCK, D.M.D., in the twenty-seventh year of his age.

Dr. Woodcock was recovering from a severe attack of diphtheria, when paralysis of the heart supervened and caused his death. He was born at Leicester, Mass., July 5, 1868.

Dr. Woodcock was a graduate of the Harvard Dental School, class of 1891. He was for a short time associated with Dr. Young, of Leipsic, Germany, but in July, 1893, he bought the practice of Dr. C. H. Osgood, No. 2 Park Square, Boston, which he continued. He was instructor of mechanical dentistry at Harvard Dental School.

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# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

**The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.**

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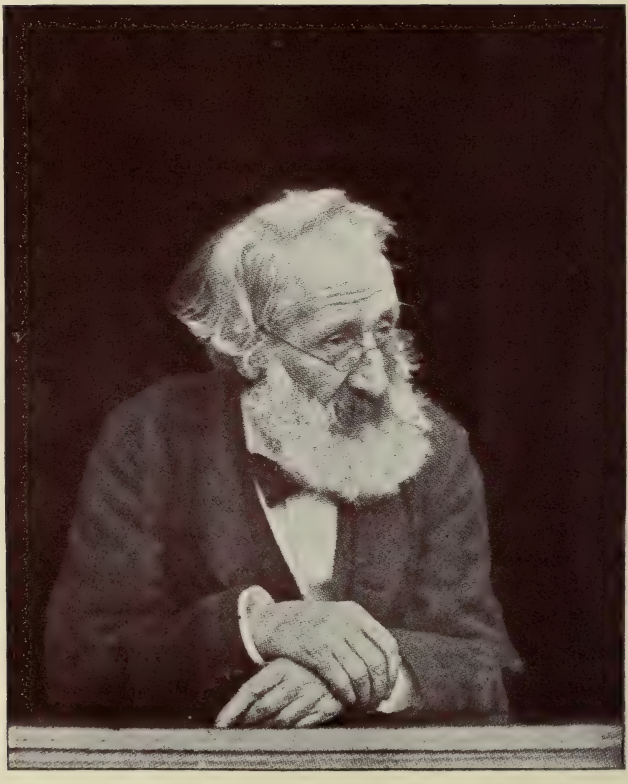
# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING JULY, 1895.

*July* 2.—No. 541,940, to ROBERT M. MAYES. Dental chair attachment.
“ “ No. 542,138, to BERNARD B. BRAY. Dental bridge-work.
“ “ Reissue No. 11,502, to FRANK J. RICHARDS. Dental plugger.
“ 9.—No. 542,436, to E. P. BROWN. Artificial denture.
“ 16.—No. 542,782, to HENRY SIMONS. Tooth-cleaning implement.
“ 23.—No. 543,028, to FRANK LAWS. Tooth-brush.
“ “ No. 543,685, to J. G. HOLLINGSWORTH. Tooth-facing.



SIR JOHN TOMES, F.R.S.,
F.R.C.S., L.D.S. ENG.

THE

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# ORIGINAL COMMUNICATIONS.

## THE ORIGIN OF SALIVARY CALCULUS.

BY HENRY H. BURCHARD, D.D.S., M.D., PHILADELPHIA, PA.

As will be seen from the accepted name of these deposits, their main origin is recognized to be from the saliva. Every writer upon the subject of dental or oral pathology has advanced some hypothesis in explanation of their presence and manner of deposit; but, in searching for the exact *modus operandi* of their formation, it is found that none of them sufficiently explains the composition of the concretions, their color, or the occasionally odd situations in which they are found.

This much is accepted beyond cavil,—that they are in large part composed of salts of calcium (almost entirely the phosphate, and a small amount of carbonate), and combined with organic matter; the lime-salts having been held in suspension or solution in the saliva, and, for some insufficiently-explained cause, precipitated in favorable situations, and under not clearly explained conditions.

One hypothesis regarding the cause of the precipitation of the calcium carbonate has been, or is, that calcium carbonate is held in solution by virtue of the presence of dissolved carbonic acid, as a bicarbonate in the saliva contained in the acini and ducts of the salivary glands; and when the saliva is poured from the ducts into the oral cavity, the carbon dioxid is disengaged and escapes, and the calcium salt, held in solution thereby, is precipitated in consequence.

Another view is, that the calcium salts are merely held in suspension in the saliva, and are precipitated when the saliva is at rest in the oral cavity. This is supported by test-tube experiments

An opinion held by the writer for some time, but never published, was as follows: it is known that the saliva contained in the salivary glands and ducts is a fluid of alkaline reaction, holding in solution salts of calcium.

It is also recognized that in most mouths the reaction of the fluid contents is acid; the alkaline secretion of the glands mixing with the acid fluid contained in the mouth, causes the precipitation of substances soluble in an alkaline and insoluble in an acid fluid. The weakness of this assumption, as a full explanation, consists in the fact that calcium phosphate is soluble in dilute acids and is precipitated by alkalies, a reversal of the conditions necessary to prove the first assumption. But still, as we see, the lime-salts of the saliva are precipitated in a dilute acid solution. Another hypothesis, not sufficiently explanatory, is that the calcium phosphate, in the fluid at rest, is deposited and retained in pockets, or on irregularities which may be present, and form a nidus. Accepting this hypothesis, we are still confronted with the question of mode of combination of the organic matter, which forms a constant and large part of the concretions.

These several difficulties and objections have prompted the writer to some experimentation upon the matter in question, in the hope of arriving at an explanation of the several factors involved, chemical, physiological, and pathological. It is believed that, in substance, the deductions drawn are warranted by the facts presented.

There is involved, first, the fluid which furnishes the material from which the concretions are derived.

Second, the cavity into which this fluid is poured; its configuration, boundaries; the anatomical and physiological peculiarities of its component parts, and pathological manifestations in and about these parts. These latter are present, as we know, in the vast majority of cases; or at least in so great a ratio, that it is difficult to draw a line between physiological and pathological states.

Third, the composition, structure, and appearance of the substances resulting through the interaction of the preceding factors.

First, with respect to the saliva itself. It is the combined secretion of three pairs of glands and, in part, that of innumerable small glands. The secretions of each pair of glands possess a distinctive composition. According to Landois, the secretion of the parotid gland contains no mucin, has calcium in solution in the form of bicarbonate, and has present the greatest amount of $CO_2$ of any of the secretions of the several glands, and, according to Foster, contains probably globulin. Upon standing, calcium carbonate is deposited, this owing to the escape of the carbon dioxid which has held it in solution as bicarbonate.

The secretion of the submaxillary gland contains much mucin, and also deposits $CaCO_3$ upon standing. That of the sublingual gland contains more mucin than the former, and is quite strongly alkaline.

Jacubowitsch gives as the result of analysis of the mixed secretion:

| | |
|---|---|
| Water | 99.51 |
| Solids | .49 |

and of the solids:

| | |
|---|---|
| Soluble organic matters | 0.13 |
| Epithelium and mucin | 0.16 |
| Inorganic salts | 0.102 |
| Potassic sulfocyanid | 0.006 |
| Potassic and sodic chlorids | 0.084 |

Hammerbacher gives as the ratio of the solids in 1000 parts of saliva:

| | |
|---|---|
| Epithelium and mucin | 2.2 |
| Ptyalin and albumin | 1.4 |
| Salts | 2.2 |
| Potassium sulfocyanid | 0.04 |

Külz found that of the 7 c.c. of gases contained in 100 c.c. of saliva there was 3.5 c.c. of free $CO_2$ which could be pumped out of it.

From the list of solids it will be seen that mucin and inorganic salts form the greater amount. Of the salts of calcium different analyses show the carbonate and phosphate to be present in variable amounts, the phosphate usually stated to be in greater amount.

The next consideration is the cavity into which this combination of secretions is poured.

This is an irregularly ellipsoid cavity, open at its posterior, and divided into two sub-cavities,—an external and internal,—by an arch composed of thirty-two pieces (the teeth) and their supports, which are covered by mucous membrane. All the walls of the entire cavity are covered by mucous membrane, imbedded in the substance of which are innumerable glands secreting mucus, which secretion is mixed with the saliva.

This is an important fact in the unfolding of the present view of the subject,—that there are contained in all of the mucosa of the mouth glands at all points secreting mucin.

The floor of the inner general cavity, inclosed by the teeth and gums, contains another,—a box-like cavity,—of which the gum-covered alveolar ridge and teeth form the greater part of the periphery.

The reflection of the mucous membrane of the base of the tongue, with that of the floor of the mouth, is its posterior boundary ; the floor of the mouth, its movable base ; and the under-surface of the tongue, its movable roof. Into this cavity are poured the secretions of the submaxillary and sublingual glands,—secretions containing comparatively large amounts of mucin and calcium phosphate and carbonate.

The great external cavity is a crescent having a thin body ; its inner wall, the teeth and alveolar walls ; its outer encasement, the soft tissues ; the mucous membrane covering the orbicularis oris, buccinator, and the other lip-moving muscles.

The walls of these cavities have occasional periods of rest. When in movement the fluid contents are agitated, and the muscular boundaries by their action sweep the surfaces of the immovable walls.

The tip of the tongue has a lateral sweep from about the lingual surface of first molar of one side to that of first molar of the other.

The buccal and labial aspects of the anterior teeth are swept by the action of the extended and bent tip of the tongue. It will be seen that at the lingual aspect of the teeth, at the junction of gum and teeth, the contact of the tongue with gum and teeth leaves a V-shaped space. There are also similarly shaped spaces made by the peculiar contact of the teeth themselves.

The palatal surfaces of the superior teeth are swept quite thoroughly by the tongue,—their labial and buccal aspects almost equally as well,—except that on the buccal surfaces the action ends at about the junction of the first and second superior molars.

The movements of the sides of the tongue sweep clear the lingual walls of the inferior molars, except at the angle of junction between the gums and the teeth.

The movements of the lips and cheeks sweep the anterior walls of the teeth, except at the cervices of the inferior incisors and the upper incisors, and of the superior molars. It is seen, therefore, that the angular spaces marking the junctions of gums and teeth are less subjected to this cleansing by muscular action than are the surfaces in general. The same mechanical forces would tend to drive any pasty material into the interstices between the teeth.

In addition to this purely mechanical cleansing, the fluid contents of the mouth are, through the same movements, kept in agitation, and are driven about into all open spaces, cleansing by irrigation.

When the muscles are at rest, there is a space between the mucous membrane covering the buccal muscles and the buccal faces of the superior molars. There is formed a pocket, the line of contact of the cheek with the first molar marking its forward extremity, that with the third molar its posterior, the deepest part of the pocket being opposite the superior second molar, into which the secretion of the parotid gland is poured.

After all of the food-débris which is removable by the mechanical cleansing through the movements of the tongue, and by the irrigating action of the fluids of the mouth, has been swept away, there will be found more or less remnants clinging to surfaces and packed into interstices.

After eating, man, in common with other animals, sets in action a series of muscular movements with a view to remove food-fragments. Extraordinary tongue-movements are made ; the buccal and labial muscles are worked alternately, removing mechanically much débris, the saliva aiding in washing some of the material away ; and, in addition, a suction is created which draws from between well-formed teeth much of the waste material. But, despite this, the cleansing is not complete.

The next step is an examination of the nature, the composition of this débris.

A fact which has no doubt impressed most of us is, that it is only man, and animals fed upon the food used by man, that are affected, at least in any marked degree, by dental caries and concretions upon the teeth. It is a natural inference, therefore, that the sources of these disorders are in a great measure due to food-habit.

Among the undomesticated, and among some domesticated animals, the food is taken in a raw state. In the herbivora the food is mainly carbohydrates, inclosed in great part in the tough fibrous structures of plants. When grain is eaten, but a small amount of débris remains. During the mastication of these substances the fibrous structures of the food serve as a means for mechanical cleansing. The starchy foods do not appear to have a tendency to mass. The starch is gradually set free from its envelope and ptyalized, leaving a mass of gluten, coherent and not pasty, and from which no débris remains.

In the carnivora, fleshy foods, when eaten in a natural state, are in such a condition that the muscular and fibrous tissues have no disposition to break or tear in fine fragments, and they thus have little or no tendency to pack, even were the teeth of carnivora not shaped as they are, to disfavor accumulations of débris.

The operation of cooking produces radical changes in the condition of foods. The cellulose covering of the cells, inclosing starch-granules, is burst ; many varieties of starchy food are reduced to a pasty condition ; the fibrous stems of plants are made friable,—a condition favoring retention in interstices. Human beings use a greater proportion of sugar than other animals ; that is, use as a raw material a chemical substance which, with most animals, is a product of partial digestion.

Fleshy foods, by cooking, are made more tender and friable,—the solid fats are melted so that the neutral fats, palmitin and stearin, are taken in part as semi-liquids, not solids; and, it may be, have some alteration of their chemical composition. So that after mastication, small portions of muscular tissue and of hardened fats adhere to the surfaces of the teeth and pack into spaces.

It is doubtless the fact that saponaceous dentifrices, by removing these fatty deposits, give to the mouth a sense of cleanliness, which prompts many persons to use these preparations in preference to simple powders.

Dr. Miller's researches as to the etiology of dental caries, together with the fact that this is the most common of all diseases affecting mankind and, occasionally, lower animals, leave no doubt as to the primary cause of the disease. It is due to the action of a solvent, lactic acid ; this body the product of a specific fermentation, set up through the agency of definite micro-organisms which, according to Pasteur, in a mixture containing nitrogenous material and carbohydrates, split the latter up into lactic acid : $C_6H_{12}O_6$ becoming $2\ C_3H_6O_3$ ; the nitrogenous matter serving for the nutrition of the organisms. Troussart also mentions specifically that lactic fermentation requires the presence of proteid matters. He also calls attention to the common bacteriological datum, that the fermentative action is self-limited ; that it is checked by formation of lactic acid. Also, that a slightly alkaline medium is most suitable for the propagation of the lactic ferment.

Unquestionably in some mouths the lactic fermentation is accompanied or followed by more or less of butyric fermentation. Collections of food-débris form the foci of development for the fermentation inaugurated by these organisms ; so that the use of food leaving débris which masses and packs in inaccessible places, is the primary factor, the predisposing cause, in the fermentation. The butyric fermentation follows upon the lactic, and in many cases, food deposits long retained are found to be the foci of putrefactive decomposition.

In connection with this matter, I have noted that in some gingival disorders the putrefactive decomposition appears to occur, without the transition fermentations.

Food which does not leave débris about and between the teeth offers no soil for the development of the micro-organisms. As the operation of cooking is that producing this difference of condition in food-stuffs, it is that which is responsible, at least in a great measure, for the production of lactic fermentations in the oral cavity.

Differences of oral condition no doubt modify the activity of these fermentative processes, hence in the amount of acid formed. Disease-conditions, whether purely local or manifestations of other disorders, —any grade or variety of catarrhal stomatitis,—form a suitable soil for the activity of ferments.

In addition to this result, catarrhal processes are associated with a swelling of the tissues, an increased exudation into the perivascular spaces causes the epithelial cells to swell by imbibition ; the secretion of the glands is increased and modified ; there is a visible swelling of the membrane affected, about the necks of the teeth. According to the grade and variety of the stomatitis, the swelling causes the formation of pockets, of variable depth, due to what is known as the dental ligament resisting detachment and the mucous membrane swelling around it.

We have examined now two of the factors involved,—first, the fluid, the *origo materiæ;* second, the cavity into which this is poured, together with contributions made by the glands of its walls, and also some of the adventitious matters which are suspended in the combined fluids.

The condition is : A fluid containing, as its greater portion of solids, calcium salts and mucin, in solution, is poured into a cavity containing fluid ; at several situations of the cavity, lactic fermentation is in progress. In addition to this, the places of lactic fermentation have, as one wall, a membrane containing mucin-secreting glands, and the general fluid is in consequence made acid in reaction.

This is a condition, some degree of which is almost universal. It is subject to gradations in different individuals, and, indeed, in the same individual.

The third inquiry is as to the nature of the products discussed. These are accretions varying in degree of hardness from that of a granular mass, less hard than plaster of Paris, to the stony concretions found at times beneath the borders of the gum line, and approximating white coral in hardness. In color, they range from light yellow to dark green. In amount, from small scaly particles to masses in which several teeth are imbedded, so as to make the outlines of the several teeth indistinguishable. The lighter the collections are in color, the softer or more friable they are ; the darker they are, the more dense ; or the more dense they become, the harder they are.

There appear to be three classes of the calculi,—those of the variety usually found upon the inferior incisors; second, those upon the buccal faces of molars; and third, the green deposits, some part or all of which are beneath the margin of the gum. Judging from my observations thus far, I believe the latter are due, at least in great part, to the altered secretion of the gingival glands ; some alteration in the usual composition of the colloid medium producing modification of the calculus. They are formed more slowly than the others, and it appears that they are produced in some cases *after* the formation of yellow calculi. My own interpretation of this is, that the yellow calculus causes nutritive disturbance in the small glands, and according to the grade of this disturbance, ranging from irritative activity to pus-formation, will be the character of the resulting calculus.

The light-colored and softer masses have a predilection for two positions at the linguo-cervical aspects of the inferior incisors, to some extent the labio-cervices of the same teeth, on a line with the openings of the ducts of the submaxillary and sublingual glands.

Upon the buccal surfaces of the superior molars, opposite the opening of the ducts of the parotid glands, the dark, hard deposits are usually, or almost always, confined to the cervices of the teeth projecting into or from the sharp angle of junction between the teeth and gums.

It is not known to the writer that any separate analyses have been made of these several varieties of calculi. Dark-colored, dense, and hard specimens tested by the writer have given, upon heating, a strong animal odor, leaving a débris of some mineral matter and carbon; the mineral matter perfectly soluble in dilute nitric acid, with but little effervescence, calcium phosphate probably. Occasionally there was a faint response to the murexid test. The yellow deposits behaved in a similar manner. The crude analysis of the writer showed no marked difference in the composition of the several varieties.

Harlan, "American System of Dentistry," vol. ii, quoting Schehevetskey, gives as an analysis of the deposits:

| | |
|---|---|
| Water and organic matter | 22.07 |
| Magnesium phosphate | 1.07 |
| Calcium phosphate | 67.18 |
| " carbonate | 8.13 |
| " fluoride | 1.55 |

Nine-tenths of the deposits is composed of calcium phosphate, water, and organic matter. It has been determined that the 22.07 per cent. is composed in great part of mucin. (I have seen this stated, but cannot recall now whose analysis mentions the mucin.)

The problem is to determine the interactions in the two factors which stand in causal relation to the third. Why should these deposits occur? The following experiment appears to furnish a reasonable basis for the formation of a hypothesis which, it is hoped, will through further investigation ultimately throw more light on this subject.

Place in a test-tube two inches or more of saliva,—a fluid holding in suspension lime-salts, mucin, and an amount of $CO_2$. Over this pour one or two drops of a ten per cent. solution of lactic acid. Almost immediately a turbidity of the contents of the test-tube is noticed. This gradually but quite rapidly resolves itself into a coagulum, extending as a core through the fluid; it slowly contracts, and, in contracting, rises until it floats upon the surface. If the saliva has been ejected for some time, the salts of calcium are beginning to precipitate. In the condensation of the coagulum the suspended material is entangled in its meshes, and rises as part of the coagulum; perhaps a portion of the calcium phosphate being converted into a lacto-phosphate.

A reaction which may have application here is the following: If to a solution of lactic acid milk of lime is added, a portion of the calcium is converted into calcium lactate; another portion is precipitated as calcium phosphate.

The proportion of lime-salts entangled appears to be small in this experiment. Upon filtering the solution, a coagulum (white) is left upon the filter-paper, which in drying assumes a dark color, a mixture of green and brown, about the color of some of the hard varieties of calculus.

To the filtrate add a solution of oxalic acid; a white precipitate separates and falls,—calcium oxalate.

As this is the reaction for calcium lactate, it is probable that there has been formed calcium lactate, soluble and left in solution, and calcium lacto-phosphate entangled in the coagulum.

It was experiment No 1 which first drew the writer's attention to this matter as a possible solution to this undetermined question,—the *modus operandi* of calculus formation.

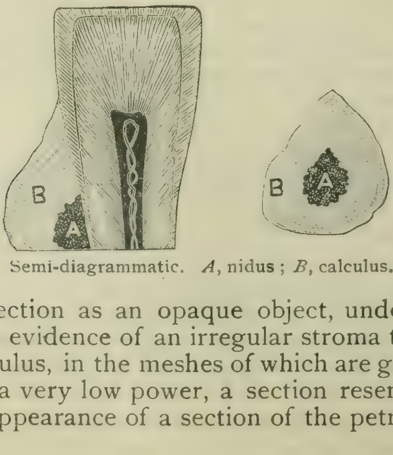
The conditions existing in the general cavity of the mouth (that is, the part containing the greater part of the saliva) are the reverse of the test-tube experiment. The fluid containing mucin and lime-salts was poured into a dilute solution of lactic acid. In a test-tube about two inches of a one per cent. solution of lactic acid were placed; there was then poured on it about one inch of saliva; immediately upon the contact of the fluids a coagulum formed,—formed so quickly that there was no apparent diffusion of the saliva into the lactic acid solution.

The more dilute the solutions of acid are used, the thinner are the coagula. With a one-half of one per cent. solution the coagulum is a viscid but well-defined mass floating in the general fluid. The coagulum forms so quickly that any particles suspended in the saliva are inevitably entangled in the meshes of the coagulum. In this event the calcium phosphate is probably combined with the lactic acid, forming a lacto-phosphate.

In the light of these investigations the writer recalls with pleasure a conversation between Dr. E. C. Kirk and himself over a year ago. In discussing the question of uratic deposits upon the roots of teeth, while one of these bodies was stewing in nitric acid, preparatory to making a "murexid" test, Dr. Kirk said, "I believe all these calculary deposits will be found to belong to one great order. That salivary calculi will be found to be one group of several chemical bodies which are formed by the precipitation of lime-salts in colloid media, and this is the common factor in the formation of calculi in general. That about a nidus these substances will be deposited or formed in some definite manner; that they are more than mere agglomerations of lime-salts with extraneous matters; that they resemble calcoglobulin more than they do mere cemented precipitates, and I believe all calculi will have a family similarity in general structure, no matter in what part of the body they are formed."

Recalling this discussion, the writer has detached from an inferior incisor the large calculus illustrated.

Viewing the surface in contact with the tooth, there is some appearance of lamination. This is also seen, but more faintly, upon section.



Semi-diagrammatic. *A*, nidus; *B*, calculus.

Viewing this section as an opaque object, under an 8-10 objective, there is some evidence of an irregular stroma traversing the substance of the calculus, in the meshes of which are glistening particles.

Viewed under a very low power, a section resembles dense bone; it has about the appearance of a section of the petrous portion of the temporal bone.

It is purposed later to make sections of such teeth and calculi, prepared after the Weil method, and try to view them by transmitted light, if possible. This was suggested to me by Dr. Kirk during the conversation quoted. There is a field here for the specialist in histology.

Certain conditions are present, at least in part, which under other circumstances give origin to calcoglobulin ; a lime-salt deposited in a colloid medium. I am not yet prepared to state that this is the result here ; but the two factors mentioned are present.

"If a soluble salt of lime is mixed with a precipitant solution, the precipitate will be an amorphous powder.

"When the lime-salts are precipitated in gelatin, an albuminous, or other colloid medium, the character of the salt is materially altered. Instead of a powder there were found various curious but definite forms, quite unlike the character of crystals or powder formed without the intervention of the organic substance.

"If carbonate of lime be slowly formed in a thick solution of albumin, the resultant salt has changed its character. It is now in the form of globules laminated like tiny onions. These globules, when in contact, become agglomerated into a single laminated mass. The globular mass, at one time of mulberry-like form, loses the individuality of the constituent smaller globules and becomes smoothed down into a single mass or layer." (Rainey.)

"Mr. Rainey suggests as an explanation of the laminated structure that the smaller masses have accumulated in concentric layers which have subsequently coalesced.

"Professor Harting later found that other salts of lime would behave in a similar manner, and, by modifying the condition of the experiment, various forms might be produced.

"In the calcospherite, Mr. Rainey was aware that albumin actually entered into the composition of the globules, since it retained its form even after the application of an acid.

"Professor Harting has shown that the albumin left behind after treatment of a calcospherite with acid is no longer ordinary albumin ; it is profoundly modified, and exceedingly resistant to the action of acids, alkalies, and boiling water. He proposes for the modified albumin the name of calcoglobulin, as the lime appears to be held in chemical combination, for the last traces of lime are retained very obstinately when calcoglobulin is submitted to the action of acids." (R. R. Andrews, after Rainey and Harting.)

The centers of lactic fermentation in the mouth are scattered in every mass of food-débris ; the process is inactive, so the saliva is becoming charged with lactic acid at many places, hence the coagula would be scattered generally through the saliva.

The experiment noted has been repeated several times ; the results are always the same. Chemically, the conditions or factors are analogous to those existing in the human mouth, additions of saliva being made to a solution of lactic acid. It is fair, therefore, to assume that in the mouth, when the saliva comes in contact with solutions of lactic acid, these coagula will form.

In the box-like sublingual cavity it is seen that its highest point is at the linguo-cervical aspects of the inferior incisors, hence as the coagula are lighter than the liquid in which they are suspended, they would agglomerate at that situation, and by the movement of the tip of the tongue be pressed between the teeth, filling the cervical spaces, and into the depression or fold of the gingivæ.

In the folds, the recession or depression marking the junction of the gingivæ with the teeth, accumulations of débris are found. Through the mechanical cleansing by the tongue most of the material has been removed, but there remains a line of deposit which forms a food-supply to micro-organisms, and producing, it may be, substances which act as local irritants. It will be remembered that, as stated, in this fold of gum there open the mouths of numerous glands secreting mucin. In addition to the normal secretion at these points, the local irritation, due to the presence of foreign and irritating bodies and substances, will produce an increased and, it may be, an altered secretion in the glands.

There is another prolific source for such disturbance,—an acquired predisposition to gingivitis, or, it may be, stomatitis. From their structure the gums are adapted for rough usage; are fitted (and, no doubt, in all animals designed) to receive without injury a marked degree of pressure or buffeting during mastication. In addition to the cooking of food, rendering it a more fitting soil for the breeding of micro-organisms, rendering it more decomposable, the softening of food-stuffs by the cooking process literally robs the gum-tissue and the supporting structures of the teeth of proper exercise. This lessening of functional activity (disuse) is a source of debility, so that an oral condition is engendered furnishing a lessened resistance to disease-producing agencies. The secretion containing mucin is exuding into a collection of fermenting material; mucin is coming in contact with lactic acid, and bathed in a fluid containing salts of calcium.

The pressure of the elastic gum upon the collection flattens the coagulum, and through the movements of the tongue or any muscular parts, that portion of the coagulum above the gum-margin is brushed away. The swollen gum-tissue forms a pocket, in which a coagulum of mucin containing lime-salts is protected from mechanical dislodgment, and thus, like any similar deposit, hardens with age. As is daily noted, the calculi ultimately cause the detachment of the gum from the tooth, and exhibit the congestive gum-margins characteristic of this condition. By the pressure to which the coagulum is subjected it is condensed, has much of its fluid pressed out. Artificial coagula are seen to acquire a dark tinge during a progressive drying, and resemble in appearance those subgingival deposits.

As will be inferred from this presentation, the writer is disposed to attribute a different origin (at least different in part) to the subgingival deposits, from that of the epigingival, those at the cervices of the inferior incisors and upper molars.

The question of the condensation, the agglomeration of the coagula at the cervices of the inferior incisors, appears to be due to the specific gravity of the coagula being less than that of the saliva. This being the highest point of a cavity, they accumulate there. No doubt after the formation of the coagula, these latter offer, by their physical character, a nidus for the deposition of calcium salts, and successive additions of coagula. Situated as they are opposite the openings of the salivary ducts, they have entangled in their substance the precipitated calcium phosphate.

Another probable direct course of additions to the concretions is that, as stated in the analysis of saliva, it contains an amount of free carbon dioxid, enough to hold calcium salts in solution, both the phosphate and the small amount of carbonate present ; upon exposure to the air the carbon dioxid escapes, and the calcium salt precipitates.

Successive coagula and lime-deposits occur, massed between the teeth by the action of the tongue.

The next situation, the buccal faces of the superior molars. These are usually the softest of all deposits ; this condition due no doubt to the absence of mucin in the secretion of the parotid gland. Mucin, however, is contained in the buccal pockets, even if only that secreted by the gingival and buccal glands. The calcium salts are precipitated, owing to the escape of carbonic acid, and are entangled in the coagula. As a rule these deposits are mechanically displaced by the action of the buccal muscles and food-masses during mastication ; they are always subjected to a free washing by the watery parotid secretion. If the masticatory function be lost or disused upon one side, there is an absence of the mechanical cleansing, and deposits of calculi occur more frequently. It has always been noted that these deposits were protective against caries to the surfaces covered by them. It is evident, therefore, that lactic acid cannot be present upon their under-surfaces ; no doubt it has combined with the phosphate, forming a lacto-phosphate of calcium.

The most favorable conditions for the formation of calculi appear to be a cavity or space, in which the fluids of the mouth may rest as in a pool, and to have some rough projection to engage and retain precipitated matters ; and, again, the presence of some foreign body which may act as a nidus to the agglomerating mass.

Accepting the truth of this hypothesis of the origin of calculi, it is evident that their prevention is essentially the prevention of the formation of lactic acid. It will be seen also that the same therapeusis is the prevention of dental caries.

The active cause of the production of these organisms is always present (the micro-organisms), and it is accepted that the condition of the mucous membrane and its glands determines in a great measure the amount and activity of these bodies. As the first means of prevention, the hygienic condition of the gums must form the first element. It is probable, as stated, that the debility of the soft tissues of the arches is due in great part to insufficient usage.

The second factor, the removal of fermentable material, as the process of cooking food, leaves an increased amount and adhesiveness of débris ; mechanical dislodgment and removal are necessary. These means lessen the food-supply, the soil for the micro-organisms ; but as it is impracticable to remove it in toto, the next solution of the problem is the destruction of the organisms themselves,—this by means of antiseptics.

If the hypothesis presented is accepted, a fresh significance is given the use of antiseptic mouth-washes.

Among animals which are fed upon pasty food, particularly about the teeth of lap-dogs, pet terriers, etc., it is not unusual to find extensive deposits of calculi. These are always associated with more or less stomatitis, in part unquestionably due to the irritation produced by the calculi, and in some cases an oral catarrh has clearly preceded the deposits. I remember one case, a Blenheim terrier, subjected to the most miserable form of coddling, ill-feeding, and lack of exercise, whose teeth were covered by incrustation of hard, green deposits, and in addition there was a well-marked pyorrhea. I extracted several of the teeth for this animal. An old *Felis concolor* (puma), at the Philadelphia Zoological Garden, had a similar affection. Dark deposits could be seen along the necks of the teeth, the gums turgid and showing a blue line over the deposits; several teeth were loosening.

The hypothesis as at present formulated is that salivary calculi are due to the action of lactic acid upon the secretions of the salivary glands and the glands of the oral mucous membrane. That by the union of these two substances a coagulum of mucin is formed, in which are deposited and entangled precipitated lime-salts, mainly lacto-phosphate. That the deposits are similar to calculi in other parts; but whether the union of the colloid with the lime-salts is more definite than a mixture is undetermined.

This paper is simply a statement of the results of experiments to date; it is purposed to do further work in this field, and these views as present expressed may be modified, but I believe the central idea will remain intact. It is presented as it is at this time at the request of the editor of the DENTAL COSMOS, and thus represents work in process of transition, not completeness.

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# DO WE KNOW ANYTHING OF THE EVOLUTION AND ETIOLOGY OF DENTAL CARIES?

BY DR. HENRY GERHART, LEWISBURG, PA.

(Read at the annual meeting of the Pennsylvania State Dental Society, July 9, 1895.)

WHEN I remember that to the investigation of the causes and processes of the lesion of dental caries some of the keenest scientific men have bent their best energies, it will be putting it into very tame terms to say that I approach its discussion, in this presence, with diffidence and reluctance. Starting with the premise that I know not anything about it, you will see the difficulties of the position in which your committee, by their insistence and flatteries, have placed me.

The selection of this subject has not been the result of casting about for a topic when your committee commenced with their blandishments; but for a long time it has, in a desultory way, occupied my mind as a result of the fact that our literature has teemed with treatises on the management of teeth whose pulps are dead.

This question presented itself: Were it not better to prevent that which opens the door for such death, than to attempt the very doubtful salvation of the so nearly irretrievably lost? This prevention can only be accomplished through a knowledge of the inception and development of the lesion, or its evolution.

The evolutionary theory did not spring into its present form in a day, nor from one mind. Its history is in itself an evolution. So far as the record goes, the first faint expression of such an idea came from the lips of the Greek Anaximander, in the sixth century before our era. It is, however, not improbable that to the Egyptians and Hindoos the same ideas may have presented themselves earlier, as in some form or other they have to every civilized people. Certainly Griffis states that it was not unknown to the Japanese before the advent of Commodore Perry. Glimpses of the idea show themselves in the writings of many thinkers, from the days of Anaximander and Aristotle, through the Middle Ages; but especially in the last century in those of Linnæus, Buffon, Kant, and the elder Darwin. In the present century a host of men, too many to be cited, have labored with the idea until it was formulated by Charles Darwin, and the now lamented Professor Huxley gave us the following definition:

"Those who hold to the theory of evolution (and I am one of them) conceive that there are grounds for believing that the world, with all that is in it, did not come into existence in the condition in which we now see it, nor in anything approaching that condition. On the contrary, they hold that the present conformation and composition of earth's crust, the distribution of land and water, and the infinitely diversified forms of animals and plants which constitute the present population, are merely the final terms in an immense series of changes which have been brought about, in the course of immeasurable time, by the operation of causes more or less similar to those which are at work at the present day."

In tracing the evolution of any entity, a vital requirement is a continuity of the track. In a recent highly scientific book by Benjamin Kidd, he has left a hiatus between the "struggle for existence" and the "struggle for the existence of others," or between egoism and altruism, by bringing in a foreign or ultra-rational element between the intellectual and the ethical. In a still more recent book, by that eminent scientist, Henry Drummond, on the "Ascent of Man," a logical sequence to the "Descent of Man," he takes Mr. Kidd to task for this break in the continuity of his reasoning and want of logical coherence.

As truth is one, all scientific research is more or less cognate, and should be governed by the same legal limitations and modes of interpretation. Upon this hypothesis, President Hill, of Rochester University, has founded his "Genetic Philosophy," and in recognition of the "genetic method," all evolutionary investigation, so far as living organisms are concerned, must begin with the differentiation of the first vital cell, back of which the finite mind cannot go. For our present purpose we need not go back of the first man, further than to state that in the life and differential development of every human fœtus is not only delineated, but actually impressed and recorded in great measure on the perfect man, the history of his evolution, from the unicellular embryo which the microscope cannot distinguish from that of any other animal, or even vegetable, through all the stages from the segmentation of the unicellular globule, the open sac, the worm and higher invertebrates, the cartilaginous backbone and lower vertebrates, through fish, amphibian, reptile, mammal, tailed and tailless ape to man. As Drummond says, "The history of ages crowded into a few months, and much of it left on record."

We start with the fundamental hypothesis that from the first the sense of touch was the prime factor in differentiation, because through this sense only could the primal cell be brought into relation with environment, and all evolution is the outcome of a struggle for existence in environment, from which results the survival of the fittest.

At the end of this physical process we have the human teeth; the human teeth perfect. Why have they not so continued? This is the question to be solved. Let us approach it without prejudice.

In searching for the causes of dental caries, let us follow the genetic method of investigation and reasoning. When we examine a perfect set of teeth (and I have seen a few such, not over a half-dozen in a practice covering over forty-four years), what do we find? Chisels, hooks, millstones; cutters less keen than those of rodents; tearers less prehensile than those of carnivora, and grinders less rough than those of graminivora.

To ascertain the genetic causes of dental caries, we must try to find the influences which superinduced dental development. The probability is that under the influence of the sense of touch the chisels were developed through the necessity of severing portions of fruit and roots, and when flesh was added the hooks took shape, and when to these nutrients were added nuts and other seeds the conformation of the millstones was determined,—that is, if all these were not simultaneously differentiated.

Under the influence of these environments a normal, healthy condition was doubtless maintained for uncounted generations of anthropoids and of the pre-adamite races.

May we not logically conclude that, so long as an approximation to these environments obtained, these normal and healthy conditions would be maintained?

If we accept the definition of Huxley, in which he says, "By the operation of causes more or less similar to those which are in operation at the present day," we will be justified in assuming that the change in the character of the tooth-tissue that must have been presented by the cave-dwellers to the character of the same tissue as presented by our race to-day is due to change in environment, and not to change of operating causes or law.

This change of environment may consist of changed chemical or other physical characteristics of the food, and changed relations to the elements resulting from clothing and housing. It is probable, however, that the most potent factor in bringing about this change is to be found in the physical characteristics of the food aside from the chemical, although the chemical should not be left out, since it involves the supply of pabulum.

It is safe to say that the anthropoids, and as well the earlier preadamite races, ate their food uncooked, and to a large extent utilized the teeth to remove from fruits and nuts the rinds and husks when these were not eaten, and to tear the skins and break the smaller bones of such animals as were eaten.

The genesis of the retrogressive change doubtless dates back to the time when man first utilized heat in the preparation of his food. Most of you have read, among the Essays of Elia, the whimsical "Essay on Roast Pig." Doubtless the genial Lamb was close to the truth as to the manner of the discovery of the toothsomeness of roast pig; but it is equally probable that chronologically he has placed it a thousand centuries too late in the history of the world, and that, instead of the pig being roasted accidentally in the burning house of a Chinese bumpkin, the pig or some other animal was caught in hot lava or other volcanic emanation, being thus the first cookery of the Troglodyte.

The development or evolution of the cuisine, which includes milling and butchering, was evidently, like all other evolution, a slow process. Equally slow was the change in the physical characteristics of the teeth. There is reasonably certain evidence that the effeminacy or lack of deterrent force of the teeth has kept even tread with the refinements of the cook.

There seems little reason for doubting that the constantly diminishing necessity for the exercising of the teeth and jaws has had great influence in destroying the power of resisting the adverse forces which open the door to dental caries, and as well in diminishing the volume of the muscles and the size of the bones of the face.

As corroborant of this idea, permit me to quote some short passages from the account which Dr. G. V. Black, of Jacksonville, Ill., has given us of his brilliant and valuable experiments with his gnatho- and phago-dynamometers :

"The habits of civilized people in the preparation of food render the use of great force in mastication unnecessary, and much the greater number fall into the habit of using but little more than the necessary force.

"Food taken in large masses and covering greater surface of teeth —more teeth—requires greater stress ; while if food is cut fine, or taken in very small masses so as not to cover so large an area of tooth-surface, it may be crushed with less stress.

"That there is a connection between the enfeeblement of the masticatory effort and the continued progress of caries seems to be very certain."

The physiological law involved is the same as that which controls the determination of pabulum to any other organ, and which grades it to the intensity of the function performed.

If so far we are near the truth, the logical inference which we must draw is that the nearer we find a people to the primitive condition of the Troglodytes or other pre-adamites, the less liable to decay their teeth would be. Such, so far as I have been able to learn, are the facts.

Within twenty-four hours I had the opportunity to examine the teeth of Standing Bear, a full-blooded Sioux of fifty-six years, just from the reservation. More perfect and shapely teeth, with denser tissues (as tested by drills), would hardly be possible. His son, who was with him, and who was educated at Carlisle, had a number of teeth filled ; he was twenty-five.

Against this conclusion Dr. J. M. Whitney, of Honolulu, enters a protest, because of what he found in the catacombs of the Hawaiian Islands ; and to one who is unacquainted with the diet of these people for many generations his word would be conclusive of the fallacy of the foregoing line of reasoning.

To me it has been from the first a matter of surprise that so dispassionate and thoughtful a man should have laid so little stress on the one article of diet which from time immemorial was the great staple of the food of this people,—poi. What is poi ?

Half a century ago, my brother, who had spent some time on these islands, described it to me as the main and cheapest food of the Kanakas, and as consisting of a somewhat viscid liquid fermented food, prepared from the root of the taro and occasionally other plants. Here we have an article of diet whose form is such as to require less functional exercise by the teeth, and becoming thereby more pernicious, if possible, than our own refined preparations.

Have we not here a verification of the conclusions at which Dr. Black has arrived? Is not this the exception which is said to be proof of the rule?

As militating against this idea of the evolution of dental caries, many will, doubtless, think of those other wonderful and patiently made investigations of Dr. Black as to the physical characteristics of the human teeth, and which indicate a very slight variation in the percentage of lime-salts between so-called good teeth and poor teeth.

It must, however, be remembered, first, that calcareous salts may not be the only constituents of the teeth which give them resisting or, as Dr. Black says, deterrent power; second, in order that his investigations may be conclusive, he ought to have the teeth of some individuals nearer to a perfect or primitive type; and third, that sometimes a very small additional percentage of one constituent will make a prodigious difference in the physical characteristics of a substance, as, for instance, the addition of twenty-five-hundredths of one per centum of carbon changes soft iron into steel and makes it capable of tremendously increased resistance.

Now, what is dental caries? Is it a dissolution of the chemical affinities as a result of pythogenic environment, or is it a true pathological condition? If either or both, why does it not attack all the teeth simultaneously, and why is it sometimes spontaneously arrested without any apparent change of environment?

If it be the former, why do not filling and cleanliness arrest its progress? If the latter, why should there be any hope of benefit from tooth-filling?

Is dental caries the process in the regular order of evolution whereby the race is ultimately to become edentulous?

We have seen that continuity is a necessity in evolution, that is, continuity of processes. So far as we can see, evolution, whether progressive or retrogressive, has manifested itself by extension or retraction, and not by decomposition of any organ.

Did the vermiform appendage of the ruminant or the ears of the ass rot away? Imagine a ruminant with three feet of appendicitis!

This one point, to me, seems to be clear. The etiology of caries has its inception in the negative fact which obtains as a consequence of diminished touch, resulting from changed environment, brought about by a change in the physical characteristics of the food, this condition exercising an influence by diminishing the activity of the physiological processes which gave the previous deterrent power to the dental tissues.

The theories as to the etiology of caries apparently resolve themselves into the chemical, whether as a result of vitiated secretions from the integuments of the oral cavity or of the presence of a specific bacillus. That there is a chemical change there can be no doubt, but what gives activity to the affinities? Is it putrefactive environment, or is it a microbe? All the facts seem to be two edged swords.

One thing is pretty well established: that after the death of the man, caries does not attack the teeth, nor does it progress where it had effected a previous lodgment. This is demonstrated on the one hand by the immense number of teeth which, half a century ago, Dr. Robert Shelton Mackenzie found on the island of Anglesey, where they had been washed out of a Druidic cemetery by a great storm. The Druids were driven from Anglesey by Agricola in the latter half of the first century of our era, yet these teeth were so perfect that a Liverpool dentist gathered a market-basketful and mounted them on plates and roots.

It is demonstrated on the other hand by the teeth of the Hawaiians described by Dr. Whitney, in which, however much caries might have progressed, it was at once arrested by the death of the owner. In this, caries is in accord with pathological conditions.

There is much evidence to show that, with the death of the body, contagion ceases.

Writing of the non-communication of contagious diseases by dead bodies, as evidenced by the immunity of the numerous dissectors of the Parisian schools, where vast numbers of cadavers of such as died of these were manipulated, Dessault says, "*Morte la bête, mort le venin*," that is to say, dead the animal, dead the venom or poison. In this he is supported by a host of other observers—Dubois, Ribes, Dupuytren, Roux, Jadelot, etc. On the other hand also it is equally in accord with the purely chemical theory, as it seems to me is demonstrated by the observations and experiments of Dr. Miller, who, if he did anything, brought out proof of the validity of this theory, by simply placing his teeth in such surroundings that the chemical conditions of the oral cavity were intensified. When these surroundings had made the least impression on some vulnerable point, the so-called bacillus, placed there by Miller, at once found its habitat, and by the chemical action of its own products hastened the disintegration.

It is confidently asserted that the pyogenic coccus, under favorable conditions, by the process of segmentation every half-hour, from a single individual will in twenty-four hours produce the enormous number of fifteen millions. If the bacillus of Miller has anything approaching this fecundity, we may imagine with what rapidity his artificial caries could have progressed.

Dr. Miller claims to have made the acquaintance of the specific bacillus of dental caries, the bacillus that originates caries, and to him we have "bent the pregnant hinges of the knee."

Is this bacillus really what it pretends to be, or has it pulled the wool over Dr. Miller's eyes? Could there be no caries without this bacillus? Could there be no other disease without its specific bacillus?

According to the "American Text-Book of Surgery," the pyogenic coccus is always present with us, floating in the blood in a state of "innocuous desuetude," until at some point inflammation is initiated, when presto, "A change comes o'er the spirit of his dream," and he multiplies with incredible rapidity, becomes too many for the leucocytes, with resultant pus and abscess.

Is this the dual character of Miller's bacillus, that it is on hand at all times to multiply and fatten when caries is initiated, or is it a specific entity differentiated from something else,—in short, an evolutionary product? Let us see.

Evolution, so far as it is understood, has followed continental lines, as is most pronouncedly demonstrated by the animal and vegetable fauna of Australasia, differing as they do radically from those of other continents.

Is this true of the bacilli of the various diseases to which men are subject?

Dr. Whitney says of the Hawaiians, "In the former days, of which we have been speaking, such diseases as typhus, typhoid, malarial and scarlet fevers, whooping cough, measles, mumps, smallpox, syphilis, and leprosy were unknown." If the bacilli of these diseases were not evolved on this continental line, how does it happen that, as Dr. Whitney indicates, the bacilli of the various oral troubles were developed?

Bacteriologists and sanitary scientists have demonstrated that most forms of filth are detrimental to the life of the so-called bacilli. Dr. Koch found the cholera microbe to disappear speedily in the presence of putrefactive bacteria. Flügge says that the refuse of cattle-stalls, kitchen water, and general filth are excellent conditions for putrefactive bacteria; but they are totally unsuitable for the growth of infective agents. In the "Centralblatt für Bakteriologie," Dr. Justyn Karlinski, after many experiments with the typhoid bacillus, uses the following language, "Je mehr Kanaljaüche und wasser, je grösser die anzahl von Faulniss Organismen, desto schneller gehen die sonst evderstandfähigen bacillen zu grunde," that is to say, the more canal filth and water, and the greater the number of putrefactive organisms, the more speedily the otherwise persistent bacilli meet destruction. Parent Duchatelet thinks that the indescribable filth of the village of Montfauçon saved it from cholera when it visited Paris in 1832.

Permit me now to recur to the half dozen cases which have come under my observation in forty-four years where adults had perfect teeth. Of these, three were farmers, two were students, and one was a thief and bummer. Two were cretins not very pronounced, and came of families in which cretinism is sporadic. Two out of six is a large percentage. One kept his teeth scrupulously clean; one rarely cleaned his teeth. Of two, the mouth seemed to be self-cleansing, while the mouths of the other two were indescribably filthy; and of these two, one, a year ago, at the ripe age of eighty-eight, carried his teeth to the grave.

These six cases indicate that the deterrent power does not reside in either filth or cleanliness, but must reside in the teeth themselves. Scientists and medical men are far from being a unit in the faith that there is a specific bacillus for each or any disease.

Numerous authorities could be quoted to show that typhoid fever has originated *de novo*, in the purest atmospheres and on virgin soils, where man had not before lived or disturbed the soil, and where the presence of a specific bacillus could not be suspected. Surgeon-General Cummings, in the London *Lancet*, says that in India typhoid fever cannot be accounted for by importation or the germ theory. Fleet-Surgeon Norbury (also in the *Lancet*) thinks it is as nearly proved as can be, that typhoid fever can arise *de novo*. One recent writer says of this fever, "Is it not conclusive that, in respect to our knowledge of its etiology, we are where we were sixty years ago, when Louis and Chomel described this disease, and that its causes are wrapped in the deepest mystery?"

Almost endless testimony of this kind, not only as regards typhoid fever, but also of all other so-called zymotic diseases, could be quoted.

After a study of the history of cholera and its visitations on the people of Western Europe and America, it would seem to me that the comma bacillus of Koch is the product of cholera and not its producer, and that it is developed by and feeds on the condition of the patient in whose dejecta it is found.

I will take time for only one incident as bearing on this hypothesis. Professor Pettenkoffer, of Munich, does not agree with Koch as to the cholera bacillus, and with the courage of his convictions he deliberately swallowed millions of the living cultures from cholera patients of Hamburg, and suffered not the least from them. The Munich journals claim that for his temerity and survival he was, through the influence of Koch, compelled to resign his professorship.

There forces itself on my mind a story about a certain Celt who was arraigned for the breaking of a borrowed kettle. He swore succinctly: first, that the kettle was fractured when he received it; second, that the kettle was whole when he returned it; and third, that, "begorra, he niver had the domned kettle at all, at all!" So it would seem, first, the bacillus does not bring caries; second, caries brings the bacillus; and, third, there is no bacillus.

On the supposition that the evolution of caries has been approximately as has been indicated, there is, or at least will be, devolved upon us a duty which will be the natural sequence of the continuity of the evolutionary process. This duty will be the restoration of the human teeth to their primitive environment, if not literally, at least to some degree in effect.

At the first blush this will seem to be an impossibility; but these are the days of rapid evolution; as compared with the past, these are the days when the arena of its operations has, in a great measure, been transferred from the physical to the intellectual and the ethical, when the "struggle for existence" is being rapidly displaced by the "struggle for the existence of others," as the next step in the ascending scale.

Hitherto, the struggle for existence has been simply the life at each stage of the progress, and this has been the source of enjoyment. So, in the struggle for the existence of others, which is not only coming, but is upon us, there will be the higher life and the higher enjoyment.

From our position, we are supposed to be, and expected to be, and are, in the van in the matter under consideration, and this presses upon us through the transition from intellectual domination to ethical control, not only the duty, but the joy of deflecting the evolutionary process from the descending plane of retrogression to the ascending plane of progression, by example, even if of sacrifice, and by precept, though often disregarded and thanklessly received.

Remembering the environment, or, perhaps better, the habits involved by the environment, which evolved, and for so many generations maintained, the deterrent characteristics of the teeth, will not the thing to be done be, to train the popular habit to an approximate return to the use of food in such physical condition as to induce an increase of muscular exertion in the performance of the masticatory function?

Whether this shall be done by a return to the appropriation of food nearer to the condition in which it comes from Nature's laboratory, or by a further evolution of the cuisine by which the food may have restored to it resistant physical attributes without its primitive crudeness of flavor and insolubility, is a question which this paper will not trench upon.

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# ETIOLOGY AND TREATMENT OF ALVEOLAR DENTAL HEMORRHAGE.

BY DR. OTTO ARNOLD, COLUMBUS, OHIO.

(Read before the Tri-State Dental Meeting, Detroit, Mich., June 19, 1895.)

EXCESSIVE alveolar dental hemorrhage following tooth-extraction, is not an infrequent anomaly in dental practice; and since serious or even fatal consequences may be the outcome of this condition, and as little is written upon the subject, I have ventured to gather together the result of my investigations and experience and lay before you my deductions and methods of treatment.

The exciting cause of hemorrhages under consideration must necessarily and primarily be traumatic. The trauma may, however, be simple or complex: viz, a simple bony socket with its connective tissue unbroken, scarcely disturbing the capillaries sufficiently to excite a flow of blood; or, there may be more or less laceration of the tissues, with fracture of its socket-walls or deeper part of the maxilla, involving larger vessels, complications that materially influence the degree of hemorrhage in the most ordinary, or, if you please, normal conditions of the system.

In addition to the trauma, there may exist a predisposing cause, viz, the condition known as the hemorrhagic diathesis, classified (by some authors) as a disease of the blood, technically termed hemophilia; more commonly the patient being designated by the term "bleeder."

In looking over the limited literature on hemophilia, I find that the first recorded mention of its existence dates back to the early part of the twelfth century. Brief and scanty references follow at scattering intervals until at the beginning of the present century it was more fully described by several American physicians, from whom in brief I deduce the following.

The majority of cases of hemophilia are traceable to heredity, although it may originate spontaneously. It is more common in males than females, the proportion being about twelve to one. A few claim to be able to recognize "bleeders," and describe them as fresh, healthy-looking persons, with fine soft skin, through which the superficial veins show with marked distinctness. These are not, however, infallible signs, as the condition may exist and not be suspected until an uncontrollable hemorrhage follows some trivial injury. Structural weakness in the vessels, and deficiency in the coagulating element in the blood, are the conditions that seem to account most plausibly for this disease.

In the statistics by Townsend, of fatal cases of hemorrhage from various trivial surgical operations, tooth-extraction is given as the cause of the greatest number. This may seem to many a startling statement; but it has never been successfully contradicted, and it should be a standing menace to the dentist, warning him against carelessness in his operations and narrowness in his professional attainments.

A condition or disease which may add the elements of danger to this common and much-practiced operation, often calls for serious thought and prompt action on the part of the dentist. The writer is one of those who believes the dentist should be broad enough and thorough enough to successfully meet every emergency that may occur in his practice,—that is, so far as it may be within human possibilities.

Preliminary to considering the treatment for excessive alveolar dental hemorrhage, I cannot refrain from emphasizing in the strongest terms the necessity for great care in operations for extracting teeth; this in itself would prevent many troublesome hemorrhages that are too evidently the result of unnecessary lacerations.

Among the favorite agents for local use in persistent bleeding from external surfaces, Monsel's salt or persulfate of iron has been much lauded. I take pleasure in the opportunity to condemn it as the most unreliable and treacherous agent to be used for the purposes under consideration. The clot that is formed by the aid of this agent is quickly formed, but too frail in structure to withstand the *vis a tergo* of the blood-current; usually it soon breaks away, and secondary bleeding follows. Forcibly plugging the bleeding socket with wood, cotton, wax, etc., for the purpose of mechanically stopping the flow of blood, is too violent a procedure, often doing more harm by expanding or distending the socket and its environment, thereby increasing the provocation.

The use of the actual cautery, likewise extensive surgical methods to the extent of exposing the larger vessels of supply for ligation, plugging foramina or canals in bones containing blood-vessels, are not, in my opinion, commendable methods at the present day. In short, I am opposed to the application of force in any form.

For obvious reasons, also, I cannot commend the use of compresses, bandaging, etc., until milder and more comfortable methods have been tried.

In my own experience,—and I have given this subject no little thought and clinical attention, with most gratifying and positive results indeed,—the only satisfactory results have been attained by the employment of the simplest remedies applied in the gentlest manner.

As an astringent for local use, tannic acid, either in powder or saturated aqueous solution, for direct application to the bleeding parts, is the most efficient and safest of all agents known to the writer, and will not fail to accomplish its purpose in ordinary cases, uncomplicated with constitutional tendencies or injury to the larger vessels.

A simple method of application is to introduce a quantity of dry tannin into the bleeding socket and follow with a pledget of dry cotton, gently placed, but filling the cavity snugly ; the subsequent expansion of the cotton as it becomes moist securing its retention.

If the larger vessels have been ruptured, it may be necessary to secure them for torsion or ligation. This would be no child's play ; but the condition is rarely met with,—at least the writer has never been obliged to resort to such measures, and from the testimony of others of longer and more extensive experience, I am warranted in the statement. If, however, arterial hemorrhage exists, and torsion or ligation is impracticable, I would recommend the application of a batter of plaster of Paris, enveloping the parts as in the process of taking an impression, the hardened mass to be left *in situ* until all chances of a recurrence of the bleeding have passed away. To allay mental excitement and diminish the frequency of the pulse-beats, drachm doses of the fluid extract of ergot may be given at intervals of three hours.

Since positive or pathognomonic signs may be entirely absent in constitutional bleeders, it is not possible to be always forewarned ; and unless the victim is aware of the tendency from previous experience, or suspects it from inheritance, there may be absolutely no data to govern the operator ; and not until the patient for whom we may have extracted one or more teeth becomes alarmed at a prolonged and persistent hemorrhage, is the case understood.

If, however, we have knowledge or suspect the existence of the hemorrhagic diathesis in a patient for whom it becomes necessary to extract a tooth, no plainer duty is evident than that every possible protective measure should be brought to bear upon the case to prevent, as far as possible, alarming or dangerous consequences.

My universal method of procedure in the management of patients following tooth-extraction, is to have them rinse the mouth freely with hot water. This encourages free and uninterrupted bleeding from the wound, and stimulates a normal reaction in the tissues, soon followed by a natural cessation of the hemorrhage. Since the adoption of hot water as mentioned, I have had less frequently to do with troublesome bleeding.

If any considerable amount of laceration has taken place, I attempt to replace the tissues by compressing with the fingers or stitching into apposition any pendent portion of the gum, prescribing as a dressing—

℞—Tannic acid, gr. xx ;
Listerine,
Aqua dest., āā ℥ iv. M.
*Sig.*—Apply frequently to the wound.

If the patient is known to be a bleeder, or, in the absence of any evidence to that effect, if the bleeding be prolonged indefinitely, I should at the first opportunity prescribe gallic acid in ten-grain doses, to be taken into the stomach every hour until the bleeding is arrested. A well-tried prescription is the following :

℞—Gallic acid, ʒ i ;
Aqua cinnamon., ℥ iii. M.
*Sig.*—Tablespoonful every hour until hemorrhage ceases.

Gallic acid as an internal astringent possesses superior properties, and is free from the disadvantage of inducing constipation. It is easily assimilated and "readily transported by the blood, therefore is peculiarly effective in all hemorrhages where the bleeding vessels are to be reached through the route of the circulation."

Tannic acid is converted into gallic acid in the stomach, therefore the dosage for a given result would have to be greater and the process slower; besides, constipation of the bowels would ensue. For direct application, however, to the bleeding part, tannic acid is the more efficient remedy.

Gallic acid, in addition to being an astringent, has the property, I am convinced, of increasing the coagulable properties in the blood, having observed the greater facility with which a clot is formed after the agent is administered.

I have never seen a case of alveolar dental hemorrhage that was not arrested after the taking of from one to three ten-grain doses of gallic acid. I consider it the most valuable agent known for the purpose in question.

Conjoined with either or all forms of treatment for the lesion in question, I strongly advocate rest for the body of the victim, the recumbent posture with the head and shoulders considerably elevated being preferred.

In conclusion, then, independent of surgical or mechanical means which might suggest themselves in given cases, I rely upon two agents, viz, gallic and tannic acids; the former for systemic, the latter for local effects.

But after all, and above all, I would emphasize that old saying of caution, "An ounce of prevention is worth a pound of cure."

# PROCEEDINGS OF SOCIETIES.

## PENNSYLVANIA STATE DENTAL SOCIETY.

TWENTY-SEVENTH annual meeting held at Eagles Mere, Pa., July 9, 10, 11, 1895; President J. A. Libbey, of Pittsburg, in the chair.

The meeting was opened by prayer, and after the transaction of the usual routine business Dr. HENRY GERHART, of Lewisburg, Pa., read a paper entitled "Do We Know Anything of the Evolution and Etiology of Dental Caries?" which is printed in full at page 832 of the current number.

### *Discussion.*

Dr. WILBUR F. LITCH. I don't pretend to be a bacteriologist, but as nobody else appears to take the floor, I will open the discussion. I want very heartily to congratulate the essayist upon his brilliant and scholarly effort. I hardly know whether most to admire its scholarship, or its audacity in throwing down the gauntlet to the whole science of bacteriology.

With some of the contentions of the essayist I very heartily agree. Undoubtedly it is true that disuse of the teeth is one of the very essential elements in the causation of caries, and that carefully prepared food requires less force in mastication; these are undoubtedly important factors, but important as they are, they do not account for all of the phenomena.

Like the essayist, I was rather astonished that Dr. Whitney, in calling attention to the condition of the teeth of the Hawaiians, did not refer to the diet of those people, so largely starchy. The poi to which the doctor alluded is an article of food than which nothing could be more pernicious, starchy, and in a fermented state, generally soft, and not requiring much mastication. Nothing could furnish a more favorable environment for the development of caries than this food, and I should be very much astonished if caries did not result under these conditions.

We have an illustration given us in many of our Southern states. The Southern field hands who lived on pork and hominy, who had coarse food, the corn very indifferently ground, probably, had almost universally good teeth, while the same race living there as house-servants, eating the same food as the whites, had carious teeth ; that is a well-known fact.

The doctor asks, Why does not caries go on after death? Of course, we all recognize the fact that an organism requires favorable conditions for its growth, and the conditions under which the dead body remains are not favorable to the further continuation of this process. If we placed a dead body in the atmosphere such as we have, it would very speedily undergo disintegration ; but remove the body to the arid belt of Arizona or to the Desert of Sahara, where the moisture which is essential to the development of the organisms of putrefaction is absent, the putrefactive process would stop ; just as in the process of fermentation, if the proper conditions are not given, it will be arrested. We can arrest any putrefaction or fermentation by changing the environments.

In regard to swallowing cholera germs : A very brilliant leading editorial in the *Medical News*, by the accomplished Dr. Gould, wound up with this final statement, that after all we find our best preservation against poisonous organisms in ourselves ; and that perhaps there is no environment more fatal to disease-germs than a good healthy stomach. That is why so many escape contagion, because the environment is unfavorable ; they are healthy, and hence organisms of disease cannot go on developing and carrying out their vicious circle of reproduction.

Dr. C. N. PEIRCE. I don't know when I have listened to a paper that has given me more pleasure than the one which has just been presented, and I agree very fully indeed with every word the essayist has said, regarding the influence of the use of function upon organisms.

Those of you who have been familiar with the articles I have written in the last five years, regarding the development of the teeth and the shape of the teeth, recognize that I have taken the ground very strongly that not only the structure but the shapes of the teeth were the result of the physical force that was exercised in the mastication of food ; not only the shapes of the teeth, but the shapes, also, of the glenoid cavities and the condyles, were determined by the movements of the jaw, and this influence was greater or less in proportion to the density or resistance offered by the food that was taken for the nourishment of the body.

Those of you who take the *International Journal* will notice in the current number an article from Professor Osborne, where he speaks of the evolution of the multiple-cusp from the single-cusp tooth, and a discussion followed which shows how those present took the ground that the shapes of the molars are the result largely of the physical force that had been exercised in the movements of the inferior jaw, or the inferior teeth upon the upper; that the primitive tooth being a single-cusp tooth and the modern human molar being a multiple-cusp tooth, this was all the result of physical force. I believe this very firmly, and also believe that the salvation of the human teeth will be simply through the adaptation of the teeth to the food, and that the decay that is going on with such destructive influence to-day is simply the result of or concomitant with a transitional condition, a modification of our teeth from the teeth of our ancestors, in a process of adaptation.

I don't believe that the human family will become toothless, but I do believe the time will come when the human family will have a set of teeth quite free from dental caries, simply because they will have teeth adapted to their needs.

We have but to refer to some of the lower animals. Take our horse, if you please; those of you who are familiar with the horse will recognize the fact that years ago the typical number of teeth was forty-four; to-day, subjected to domestication, they have only forty permanent teeth. The lower jaw has shortened; the jaws, both inferior and superior, have shortened as the brain-case increased in size, and that same change has taken place in the human family. The jaws have shortened because of the want of function or exercise, and in response to the new conditions.

You examine the jaws of the Hottentots or negroes, where they live upon coarse food, and you find thirty-two well-developed teeth, with the third molar as large and perfect as the first and second. If you examine the jaws of the modern or cultivated races, you find that the third molar is imperfect in size, or, variable, is a better word: variable in its development; variable in its appearance. All that is the result of the modification of food. That gives you an outline of the views I have had for the last fifteen years, very firmly believing, as I said, that the shapes of the teeth were due to their exercise or function; the inferior jaw being a lever of the third class, the force being applied between the fulcrum, which is the condyle, and the weight, which is the body of the jaw, with the force upon the molars, while with the reduced force anteriorly we must necessarily have these teeth sharp or chisel-shaped to be of any service whatever, and solely because of the reduction of force upon them.

Admitting that all that the doctor states in his paper is true regarding tooth-development, we come down now to the statements he made, or the inferences we draw from the statements, that the decay of the teeth is not the result of micro-organisms. It is a recognized fact that there is no more thorough antiseptic than health. The German professor who drank a tumblerful of cholera germs, containing millions of these organisms (alluded to by the essayist), drank them when he was in good physical condition. He did that to show that the cholera germs could be taken without producing cholera when one was in perfect health. All the effect they had was simply a slight disturbance of the bowels, but no cholera.

Now, it is a fact well known, or recognized, that there is no better antiseptic than good health, but we have here in the mouth the absence of function from the modification of food.

The teeth are not required to maintain that degree of density which has been previously essential to their function, so they become predisposed and a prey to disease.

No one believes, not even Dr. Miller, that the bacillus will cause decay in good, healthy teeth, with unbroken enamel; but the first condition or change that takes place is by the cultivation in the mouth of the germs of the yeast plant, which is instrumental in changing starch into sugar, and sugar into an acid; hence we have chemical decomposition, the sequence of loss of vigor and density; we have abrasion taking place. When that is once established,—we have had in the mouth, before, millions of bacteria, without any influence whatever, but when we have the abrasion of the enamel and the dentine exposed, we have the tubuli offering a habitat and protection to this bacillus. They will work in and multiply rapidly, because they find there a degree of organic matter which, through their presence and influence, undergoes decomposition; in their multiplication an acid is the product which helps to decalcify the dentine, and serious decay is the result.

Dr. Miller has shown, beyond the possibility of a doubt, that he can produce artificial caries by the use of the bacillus. While he may place the dentine of the tooth in lactic acid and obtain decalcification, he does not have dental decay; nor can he with the acid alone produce dental decay; but let him introduce into that solution the bacilli, and the conditions are changed. He gets then dental decay, a fac-simile of that which takes place in the mouth.

To Dr. Miller, more than any other living man, we are indebted for the proof of this statement. He is not the only man, others have suggested it, but he carried on his experiments until he showed us, conclusively, that it was to this bacillus that we are indebted for what we know of dental decay or caries.

Now, while this is true, it does not disprove the statement that our essayist has given us. Every one of you has seen hundreds and hundreds of teeth in the human mouth, where decay has gone on to a certain extent, then the conditions of health have changed; the environment has changed; the bacilli have died, and the decay has stopped. We have in the place of the decay a little hard brown or hard black dentine; the decay has been stopped by the change of environment. It does not prove that while it was in progress it was not the result of bacilli, not at all. It only means that the changed conditions which have taken place have been antagonistic to the bacilli, and being antagonistic, the bacilli necessarily have ceased to live and work there.

The paper read by the essayist has given me great pleasure, but these conclusions, or the conclusions he has drawn, are certainly not consistent with the facts as understood at the present day.

Dr. E. T. DARBY. I think the ground has been thoroughly covered by Dr. Litch and Dr. Peirce. There has been one point alluded to by the essayist, and also by Dr. Litch, that I wish to emphasize, and that is, the character of teeth of those who live on simple food.

Once before a society, years ago, I spoke upon the character of the food of the ancient Egyptians. I had made a considerable study of it in my visit to Egypt some years ago, disinterring many of the mummies. It is to be presumed that the ancient, as the modern Egyptians, lived upon a character of food requiring a great deal of mastication. There was great abrasion on the masticating surfaces of the teeth, but absolute freedom from caries. In the hundreds of skulls I examined, many of which I dug out with my own hands and took the bandages off and exposed them to view for the first time after four thousand years, I did not find a single instance of any evidence of caries. In the modern Egyptians, I examined the chiefs and guides we took with us, and found the same character of abrasion, with absolute immunity from caries.

The food of the ancient Egyptians was probably ill prepared and coarse in character, consisting mostly of cereals, and the food of the modern Egyptian is of the same character. He lives upon barley and beans, ground together, and made up into a kind of paste. It is so coarse that it requires a great deal of mastication before he can swallow it. I ate some of the bread made from it, and it was so coarse that it was like chewing wheat or cracked corn, which you could have swallowed equally well.

Those people have good teeth ; they could not be otherwise, because the food upon which they subsisted, and in which the phosphates and carbonates largely predominated, would naturally build up good teeth and bone, and the mastication required would keep them clean and healthy. I have no doubt that is why the ancient Egyptians had better teeth than we have, and why the modern Egyptians have better teeth than we have.

I really believe that if we could change our whole character of living, in the matter of diet and food, and have food that requires constant and prolonged mastication, we should have better teeth. I said to a mother yesterday who brought her little girl to me, thirteen years of age, with teeth going all to pieces, two exposed pulps in the bicuspids within six months,—I said, "What does this child eat?" "Why," she said, "she eats what other children eat." I said, "What does she eat?" "Well," she said, "she eats oatmeal with sugar on it. She will not eat oatmeal unless it has sugar on it and a great deal of it." I asked if she ate brown bread ; she answered, "No, she likes white bread best, and the whiter the better." I asked if she ate meat ; she answered, "Yes, sir, a great deal of meat." The child was living on food carefully prepared, requiring hardly any mastication or use of the teeth at all, and food, too, that was probably of the character that would readily and quickly undergo fermentation in the mouth.

It is a lamentable state of things. I don't know where we are going to. The character of teeth will probably be modified to suit the character of food, and the generations to come will have a kind of teeth suited to the food, but I fear they are going to be pretty poor teeth if we go on as we have been going for the past fifty or a hundred or two hundred years, having our food prepared for us and leaving nothing for the teeth to do ; the structure of teeth is not going to be better, but worse, until we go to the foundation of things and change the whole character of our food.

Dr. PEIRCE. Let me give an illustration. Take some of the armadilloes (ant-eaters). In their dental organs they have degenerated. Originally they had teeth covered with enamel, and with small cusps. To-day, if you examine the jaw, you find little pegs of dentine, but no enamel, almost circular in shape, scarcely uneven on the surface, and some distance apart.

This is a type or result of degeneration, and that degeneration due to a modification of life habit. The long tongue, covered with a viscous fluid, is a prehensile organ. The habit of life has developed a condition of the dental organization adapted to its needs. They are to-day equal to the necessity required.

Dr DARBY remarked that the true ant-eaters have no teeth.

Dr. PEIRCE. No front teeth ; the back teeth of the nine-banded armadillo are simply little round pegs.

Dr. SPYER, New York. I have listened with a great deal of interest to the paper just read, and was very much struck with the force of a good many of the truths.

I have practiced very extensively in different parts of the world, principally in South America, and have had occasion to see and examine the mouths of various classes of the inhabitants of the various parts of the world, principally in South America, Mexico, Brazil, and on the Pacific coast, in Chile and Peru. I have found that the teeth of the lower classes, and those who lived on coarse food, were just as poor in quality and required the attention of the dentist,—that is, if they would engage his services,—just as much as the higher classes, who lived in different conditions and ate a better class of food, under a refined hygiene, etc.

That has led me to the conclusion that it is the quality of the teeth, and that quality has been produced by certain manners and modes of living, and that it is not owing altogether to the condition of the food.

Dr. LITCH. What is the character of the food upon which the poor classes live, to which Dr. Spyer referred?

Dr. SPYER. The corn or grain is ground and made up into a sort of cake, called tortillas.

Dr. LITCH. Do the cakes require much mastication?

Dr. SPYER. Very little.

Dr. LITCH. Then it is a starchy food, requiring but little mastication.

Dr. GERHART. I have little to say, except, perhaps, to correct a false impression or two. In the first place, as to what Dr. Litch referred to. I did not ask the question as to why caries was arrested after death. I simply tried to say that in that respect it was according to other pathological conditions.

In reference to the operations of Dr. Miller, spoken of by Dr. Peirce, I, perhaps, am not quite so familiar with what he has done as is Professor Peirce, but that which I have read of his work, as described by himself, has satisfied me that he placed his teeth in a condition that, as I said in the paper, intensified the conditions of the mouth, and that that was one reason why his caries made more rapid progress than it does in the living mouth. Whatever he may have put on the teeth, whatever environment he may have given the teeth before putting in the bacilli as he had cultivated them, he had not produced anything that was like the condition of the mouth, and it was not until he had introduced the culture—not the bacilli alone, but the elements in which they were cultivated—into the mouth, that he got the effects which he secured; it was not until then that the conditions, or anything approximating the condition of the mouth was obtained.

In reference to Dr. Spyer, I would like to say in addition to what was drawn out by Dr. Litch, that a friend of mine, who a good many years ago was president of a university, and was in South America, told me that he had seen many of the lower classes on the Pacific coast of South America, and that there was a great deal of food used by these lower classes that was very similar to the poi of the Sandwich Islanders; that they could wipe it up with the fingers and drop it in the mouth just the same as the Sandwich Islanders do, and that it comprised a considerable portion of the food of the lower classes.

Adjourned until the evening session.

(To be continued.)

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## TRI-STATE DENTAL MEETING.

(Continued from page 794.)

### SECOND DAY—*Morning Session* (Continued).

DR. OTTO ARNOLD, Columbus, Ohio, read a paper entitled "Etiology and Treatment of Alveolar Dental Hemorrhage," which will be found in full at page 840 of the current number.

DR. TRUMAN W. BROPHY, Chicago. Alveolar hemorrhage is a subject that must excite great interest on the part of the members of our profession, because there are times when our patience and skill are tried to the utmost by it. Cases of excessive hemorrhage of this nature, directly resulting from the extraction of the teeth, have not come within the personal observation of the speaker of late years, but he had witnessed a number of cases of excessive hemorrhage in the form of ruptured aneurism of the palatine arteries, which were controlled by plugging the posterior palatine foramen or canal. The hemorrhage that comes from tooth-sockets after the extraction of teeth, as described by the essayist, and treated in the manner that he has presented, is more frequently seen. He approves of everything the essayist has said regarding the management of these cases. Certainly the application of hot water—as hot as can be borne—is excellent, having a most advantageous effect in closing the vessels. It is the impression of some of our profession that warmth will promote the flow of blood. It is true that tepid water will do so, but if the water be used as hot as can be borne, while the blood-flow seems to be more excessive for the time being, the vessels will soon contract, and the hemorrhage will cease, as the essayist has described.

The administration of ergot, as has been described by the essayist, has its advantages. It has long been known to be a potent agent in the arrest of hemorrhage.

The use of gallic acid is also advantageous; but tannic acid, in these cases, while certainly of great value, is no better, perhaps not as good as, the subsulfate of iron; not the perchlorid, for it is an escharotic, and will do a great deal of damage in certain cases. The subsulfate of iron was, he believed, first brought prominently before the profession by the late W. H. Van Buren, of New York city. In his work on the principles of surgery, it is mentioned as the most desirable of all agents for arresting superficial hemorrhage. It is not an irritant. It is not in any sense objectionable when brought in contact with the tissues. It will produce a marked discoloration of the parts, but that discoloration is not due to an escharotic effect. If the cavity of the tooth be washed with hot water, and then cotton filled with the powdered subsulfate of iron be thrust into the cavity and allowed to remain, if need be with a little pressure placed upon it to hold it in, it will in most cases serve to arrest the flow of blood. In most of those cases known to be of the hemorrhagic diathesis we shall find the patient suffering from some constitutional disease; the hemorrhage is only one of the symptoms; many times the patient has Bright's disease. We shall find excessive hemorrhage more frequently where the patients are addicted to the excessive use of alcoholic stimulants. Those of large experience will agree that men who drink to excess will have a greater flow of blood after the extraction of a tooth than those who do not. This is due to the action of the alcohol on the fibrin of the blood. We do not get the fibrin in the blood, to form the clot. If we can succeed in forming a clot, we can usually stop the flow of blood, for that is nature's hemostatic, the fibrin forming a net-work and preventing the further escape of blood from the part. To promote the formation of this clot, to aid nature in arresting the flow, we want to place something to temporarily stop the flow.

He was glad to hear the essayist say that the position is a matter of great importance, but he should scarcely put the patient in a recumbent position. In hemorrhage of the mouth, the best possible position for the patient is upright, as thus we get the benefits of gravity. If placed with his head down, the action of the hemorrhage is greater, for the reason that we have not the benefit of gravity. Blood will flow down-hill, the same as water will run down-hill.

In case of excessive hemorrhage from the socket of a tooth after its removal, if he could not arrest it by simply dusting the surface with the subsulfate of iron, which he regards as the most potent of all local applications for the treatment of hemorrhage of this character, he should plug the cavity. Perhaps the best thing for this purpose is pink gutta-percha. He would make a soft plug, dusting the cavity well with the subsulfate of iron, and then thrusting the gutta-percha, while yet soft, down into the socket, and allowing it to extend far enough above so that it could be ligated from this tooth to this [illustrating], over the top of the gutta-percha, thus holding it firmly down in the socket; or, if the occasion seemed to require it, it could be allowed to stand up above the other tooth; then bringing the jaws together, the opposing tooth coming in contact with the gutta-percha, holding it down in place; and then, by adjusting a bandage, fixing the jaws so that they could not open. Pressure is always valuable in the treatment of hemorrhage, and in no place is it more valuable than in the arresting of hemorrhage resulting from the extraction of a tooth.

It seems that the hemorrhagic diathesis is found frequently to prevail in certain families, and in those families you generally find constitutional disease, or a weakened condition of some kind. In such cases you need to approach the removal of the tooth with a great deal of care. In fact, he is one of those who believes that the teeth should not be removed, indeed ; and when the human family has become well enough acquainted with dentistry to realize its value, there will be fewer teeth removed. He believed that this meeting will be one of the best possible educators ; that its influence upon the people of this region, and upon the whole United States, for that matter, will be greater than any one can tell. You are teaching the masses the value of dentistry. You are teaching them that they should not have their teeth extracted, and you are teaching them how to avoid these accidents that come from the extraction of teeth. You are teaching them that the teeth should be retained, and that they can retain them if they seek proper advice, and do their duty in the preservation of the teeth.

Dr. CHAS. R. BUTLER, Cleveland. This subject is one of great importance, because the extraction of teeth is forced upon us daily, however much Dr. Brophy may think or say that it never should be done, and that he does it but seldom. It should be the rule to do it as the last resort, but nevertheless it has to be done.

The speaker was surprised that Dr. Arnold should even hint at the impracticability or inadvisability of using bandages or pressure. That has been considered one of the fundamental principles of surgery. Why do you put on the tourniquet when you are about to make an amputation ? It is simply to prevent the excessive flow of blood. In the majority of cases where there is hemorrhage, it comes from the laxity of the muscular power of the peripheral branches, a lack of the contraction which prevents excessive hemorrhage. And the support of the bandage, or moderate pressure, assists nature, or the little flow of fibrin which produces the clot may form it more readily because the parts are supported. The class of cases where this hemorrhage is likely to occur, is where there is a letting down of the vital powers, where the patient has been suffering from some disease, and become invalided, and there are roots of teeth that must be extracted to give relief. In cases of grippe there is that letting down of the muscular tone, this general relaxation, so that the tension must be applied from without. So that the application of gentle pressure—nothing violent of course—is necessary, as a very simple means, and in many cases will effect more than can be effected by an astringent. He was very glad to hear Dr. Brophy mention one thing, which shows the prolific powers of these men who are engaged in dentistry. There are cases where the opposite teeth have been lost, and we wish to put on a little pressure, and the trouble is to put it on. He gives us a very simple expedient. He says, "Put in that little plug, and put a ligature over the top of it." What a simple thing that is ! Many a man has struggled to get pressure from the opposite jaw. Now here you have the pressure, where there is no tooth opposite ; simply tying the little plug down, so that it cannot slip up. In regard to the advantage of the pressure. Here we have an excised wound, where the blood is flowing freely, and we close that down, and put in a few ligatures, and how soon the hemorrhage ceases. He was surprised, as he had said, that Dr. Arnold should take the position that pressure or bandaging is of so little value. He says he puts on a plaster splint or something of that kind. But remember that there is no elasticity about the plaster, while the bandage, with a little elasticity about it, hugs down closer than the plaster. The plaster splint is simply a stiffener. The persulfate of iron Dr. Butler has always considered rather severe; but this other preparation of which Dr. Brophy speaks is very valuable, and the tannic and gallic acids are good. We must sometimes have something a little more active than these acids; so that the subsulfate comes to our relief. In cases where there is apprehension of this excessive hemorrhage, we should take the precaution to check it as soon as possible, before the vessels become weakened by stretching, by the excessive hemorrhage; to check it at once by the use of hot water, and perhaps a little pledget of lint, with the subsulfate, or tannic acid.

Dr. G. E. Corbin, St. Johns, Mich. In thirty-five years of practice, with full appreciation of the justice of the remarks of Dr. Brophy with regard to the matter of non-extraction of the teeth, he had seen a number of cases of very urgent importance of hemorrhage following tooth-extraction. He had had patients brought to him from ten or fifteen miles in the country, who ought to have stayed at home; who had been bleeding all night in consequence of the extraction of a tooth by their country doctor; who had not only become weakened, but who were actually approaching a dangerous condition from loss of blood. In some such cases we find considerable laceration of the jaw; we find that bungling work has been performed. We may find, in exceptional cases, that considerable surgical aid is indicated. It is possible we may have considerable to do to control the hemorrhage by the practice of the surgeon, outside of dental practice; but he had, in a few cases, seen excessive and dangerous bleeding from the socket, where the alveolar process had not been lacerated. His experience in reference to the preparation to be used has been a little different from that of the gentlemen who have spoken. Dr. Brophy alluded to the caustic effect of the perchlorid of iron, and preferred the subsulfate of iron, because it is not so caustic. That is all true; but in hemorrhages Dr. Corbin prefers the perchlorid of iron. Talk about dusting on a little tannic acid or gallic acid; in these cases of emergency that is not quite the thing to do. It is a little too tame. You find the socket to a greater or less extent filled with a clot, and the blood oozing up from the bottom, by the side of it, in consequence of the mouth of some vessel of considerable size being held open, being ruptured, just as it emerges from the alveolar process; and that is the cause of the bleeding. Now in such a case you will scarcely meet with success, without resort to the pressure that the essayist condemned. You must plug the socket thoroughly enough to control the hemorrhage mechanically. He esteems the perchlorid of iron better than the subsulfate for the reason that it is more of a caustic, and that it decomposes this partial clot in the bottom of the socket. By taking a moderate sized pellet of cotton, saturating it with the solution of perchlorid of iron, forcing it firmly to the bottom of the socket, and then plugging thoroughly with dry cotton on the top, you will almost invariably succeed if the walls of the alveolar process are intact, if there has not been a bungling laceration of the jaw. The subsulfate of iron is many times sufficient, perhaps in all cases it might be sufficient, but in the speaker's opinion it should be applied with pressure ; and his preference, after thirty-five years of experience, is in favor of the perchlorid of iron.

Dr. J. G. TEMPLETON, Pittsburg, agreed in the main with what has been said, but should like to say something in regard to why we have hemorrhage. Aside from the hemorrhagic condition which has been referred to, the parts from which the teeth are extracted, the body of the maxillary bones, are rich in blood-supply, and the structure of the bone is spongy. It often occurs that people who are not of the hemorrhagic diathesis have hemorrhage after extraction. His method of determining whether there is likely to be hemorrhage is very simple. We all know the difference in color between arterial and venous blood. For many years he has been in the habit of watching to see whether any arterial blood came from the socket. If any, he invariably keeps the patient in the office for a while.

In regard to the styptics used, he had never had any experience with the subsulfate of iron ; but many years ago he had considerable experience with Monsel's solution of persulfate of iron. He has laid this aside, and for many years has relied solely upon the remedies mentioned by Dr. Arnold, tannic acid and gallic acid. The reason why he prefers these to Monsel's solution, is simply that Monsel's solution will arrest the hemorrhage, but it forms a coagulum that is easily perforated by a very small artery pumping against it. It will bore a hole right through. If you stop the hemorrhage with tannic acid, you have tannate of gelatin, so called, because the tannin will unite with the fibrin of the blood, and form an insoluble compound ; and a small artery may pump against it, and not bore a hole through it. He has been called on many times where physicians had attempted to arrest hemorrhage and had failed. He believes they invariably use the Monsel's solution ; and patients have been brought to him in pretty bad condition.

He was once caught out in the country, ten miles from a drug-store, with a case of hemorrhage. There was some alum in the house, and with that dissolved in hot water he made a compress that stopped the hemorrhage.

Dr. C. A. THATCHER, Kingsville, Ohio, had been greatly interested in the paper and in the discussion. Three weeks ago the speaker had had the worst case of hemorrhage he had ever seen. It came from the extraction of the tooth which he held in his hand, an upper left cuspid, one inch and a half in length. The patient was a man of Irish descent, six feet two inches and a half in height. He was not a drinking man, nor habituated to the use of stimulants of any kind. He insisted on the extraction of the tooth, and it, with a lower second molar and an upper second bicuspid on the same side, was removed. They all came very nicely, and with no trouble, and the patient returned to his work. Two hours and forty-five minutes later he returned with the most marked hemorrhage the speaker ever saw. In stooping to lift something, it seems that he ruptured a blood-vessel. The man had tried to apply simple remedies, but found no one to do the work, and not thinking any serious consequence could take place, he returned to the office. The first step was to apply hot water,—as hot as the patient could bear it in his mouth,—the clot of blood being removed from the socket from which this tooth was extracted, the hot water being applied with a syringe, washing the cavity perfectly clean. The next step was to apply tannic acid on a piece of cotton, pressing it to the end of the cavity, with little or no good result. The patient fainted from loss of blood. He afterward made the positive assertion that he had lost more than three pints of blood from the time of the extracting until he came for relief. A friend who came in with him insisted on calling in a physician, but the speaker replied that if he could not stop that hemorrhage, the man might as well die there without the physician, because he would die anyhow. The next step was to try Monsel's solution of iron, of which a good deal has been said, and of which there has been some condemnation. Monsel's solution of iron stopped that hemorrhage in three minutes and a half from the time it was applied, and Dr. Thatcher considers it the best remedy on the face of the earth in such a case. He used a compress of plaster of Paris in the cavity, removing it after six hours and a half, without any serious results, and without the return of the hemorrhage. The man returned to his work the next day without any ill feeling, without any serious consequences.

Dr. C. R. YEARICK, Detroit, Mich., wished to mention a remedy that has not been spoken of here, and that is tincture of gum benzoin, using it with tannic acid in the same manner as these other applications that have been described. First prepare a pledget of raw cotton, dip it into tincture of gum benzoin, and then into tannic acid. Place it into the socket where the tooth has been extracted, and you will have no return of the hemorrhage. It is not poisonous, and you may use it also for other hemorrhages on your hand or elsewhere.

Dr. H. P. SNYDER, Grand Rapids, in twenty-six years' experience has been repeatedly called upon to treat cases of excessive hemorrhage, and only in one or two instances in all that time has he used a chemical for arresting hemorrhage after extraction of the teeth. In the case of hemorrhage, where it is serious, time is precious, and the application of anything extraneous to remain in the mouth for six hours would be rather objectionable to the patient. The speaker's remedy for the arrest of hemorrhage is merely to first cleanse the mouth. He never removes the clot from the socket, but with a small pair of surgeon's scissors cuts off the top, if it extends into the mouth extensively; then applies a little cosmoline or vaseline to the fingers, places the patient in a reclining position, and applies a compress with the thumb and finger. The vaseline is to prevent the adhesion of the blood to the thumb and finger, so that they may be readily removed. If you arrest the hemorrhage for twenty-five minutes and allow the fibrin to form a solid plug in the socket, then no matter in what position you place your patient afterward, the hemorrhage will not occur again. Remove the thumb and finger very carefully, without disturbing the clot. He has never had a recurrence of the hemorrhage after this treatment, which he considers the most simple and perhaps the most valuable of all the methods he has used, having never had a failure in a great many cases of excessive hemorrhage. In a case occurring in Strasburg, Pennsylvania, twenty years ago, a man had a tooth extracted by an eminent dentist of Pennsylvania. Three days after the extraction of the tooth the hemorrhage had not ceased. He returned to the dentist, who used

Monsel's solution and liquid chlorid of zinc, and all the styptics and escharotics he knew of. The result was failure. The patient was then referred to a reputable and eminent physician and surgeon in that town. His treatment of the case failed. They then took the gentleman to a blacksmith, who heated an iron nearly to a white heat and cauterized the socket. That failed to succeed, and as a last resort they took him to an Indian physician, who performed an incantation upon the gentleman, who passed away during the incantation.

Dr. W. H. Jackson, Ann Arbor, Mich., remarked that nothing had been said, in describing these cases, as to what the condition of the patient was, and from what this hemorrhage arose. It is not always the simple extraction of a tooth that causes the hemorrhage. It is not the wound ; the worst case of hemorrhage he had ever seen occurred a week after the teeth were out and the clot had been formed ; hence twenty-five minutes' holding it there would not have saved it. The condition of the patient, and his surroundings, may cause bleeding to start a week afterward. This was the case of a lady who nearly had sun-stroke. There was a strong tendency of blood to the head, and her face was perfectly livid. He would stop that, and it would stay fifteen minutes stopped, and then there would come an intense pain, and the blood would spurt out three or four feet from those sockets. He would stop it with Monsel's solution, and it would do the same. Then he placed the feet of the patient in water so hot that it caused a counter-irritation and drew the blood from the head down to the feet. In fifteen minutes, from a livid face, a gentle moisture began to come out on the hands and face, and the appearance of the face became normal. The blood stopped of itself, and then there was no need of the styptics.

We have heard nothing said about the condition of the blood. There may be scarcely any fibrin in the blood to coagulate. How are you going to coagulate it without any fibrin in the blood to coagulate? In such a case stimulation of the formation of fibrin is necessary. Many hemorrhages may be stopped by simply giving from one to two drachms of acetic acid, in the form of cider vinegar. He has seen a hemorrhage of the lungs stopped in five minutes simply by administering a couple of drachms of acetic acid, in the form of vinegar. Also, you will find that tincture of hamamelis is good to administer in those cases. So long as there is not a tendency of blood to the head, anything that will form a clot will stop the hemorrhage ; but when there is that tendency, you may form a clot and it will burst away. Then hot water on the feet is very good.

Dr. H. A. Smith, Cincinnati, was struck with the aphorism quoted by Dr. Arnold that an ounce of prevention is worth a pound of cure. If more of us recognized that the extraction of a tooth is an important operation, gave more time to it, diagnosed the case and took care of it afterward, we should not have alveolar hemorrhage occurring very often. In the treatment of such a case he thinks Monsel's solution is a good thing to use, but he does not want to use it more than once. If you have to use it two or three times, then it becomes a detriment, and you have not only hemorrhage from the bottom of the socket, but you have a more difficult hemorrhage to control, from the superficial tissues. If you have alveolar hemorrhage, be sure you confine it to the alveolus. Therefore take sufficient time, and if the fee is five or ten dollars, why charge it, instead of the fifty cents that some of us seem to be in the habit of charging. When Dr. Atkinson was once asked what he would do in such a case, he said, "I would take a rough bur and put it in the bottom of the socket and rotate it." What was that for? To lacerate the blood-vessel. If you have a lacerated vessel, coagulation will occur on that torn surface, where you would not have it from an incised vessel. You would arrest the hemorrhage sooner probably if it was lacerated, which seemed to be a pretty good recipe.

He has never had much difficulty in arresting hemorrhage, because he watches for the indications of the hemorrhagic condition. There are certain signs which are apt to appear. You cannot tell certainly whether the blood lacks coagulability. You may tell from the countenance, or you may notice a lack of contractility in the vessels. These are two conditions which you may be able to recognize. One is controlled by previous treatment with ergot and other remedies, and the other with a hemostatic. The coagulation of blood is not understood. We say the hemorrhagic condition is due to a lack of fibrin. But the best investigators cannot tell you what is lacking in the blood, although there are certain remedies that may overcome that. Above all, do not extract a tooth for a person who is physically fatigued. It is said, you know, that in animals hunted to death the blood does not coagulate. A poor woman after a day's work is much more likely to bleed than after a night's rest. Therefore give time to the patient and note the case, and give after-treatment if necessary, and charge more for it.

Dr. J. N. Crouse, Chicago. I wish to make but one remark, and that is to make a correction as to the reason for the rotating of the bur in the bottom of the cavity. He had heard Dr. Atkinson make that same explanation. It was not for the laceration of a blood-vessel, but for relieving a blood-vessel held down by a fractured portion of the alveolar process, which kept the blood-vessel open and did not allow the muscular contraction that nature would have brought about if relieved. The speaker has performed that operation time and again, and has always been able to stop hemorrhage in the bottom of a socket in that way.

Dr. H. A. Smith insisted upon the correctness of his statement. It is physiologically true that if you have a lacerated surface you do have a much more ready coagulation than upon an incised wound. Therefore Dr. Atkinson made that statement. It is not the same instance. "You were not there, Dr. Crouse. You were too young. I remember well his statement, and I thought it was a philosophical explanation."

Dr. E. L. Dillman, Mt. Clemens, Mich. Some years ago at Ann Arbor, during a quiz by Professor Frothingham, the professor asked a young man, "How much bichlorid of mercury would you give to a patient under the conditions I have stated?" The student replied, "Thirty-two grains." The professor never said a word, and went on with the quiz. Pretty soon the young man said, "Professor, I made a mistake; I meant the thirty-second of a grain." "Never mind," said Dr. Frothingham; "your patient is dead by this time." [Laughter.] So you must remember, while you are determining what remedy you will use, that the patient is perhaps bleeding to death. Dr. Dillman would advise his auditors when they get home to saturate some cotton with perchlorid of iron and lay it away in a drawer. You may not need it for a month or a year, but when you do need it it will come handy. Pack the socket with this, and hold the compress down.

Dr. C. H. HARROUN, Toledo, O. There is little or no danger of a person bleeding to death from hemorrhage after the extraction of teeth. One day a lady came into his office and began to tell what trouble she had had and what she was going to do, and that if he did anything for her he would have to do it so and so. She said she had had some teeth extracted and had lost thirteen pints of blood. [Laughter.] He told her most emphatically that he was the dentist, and that under the circumstances if he had to perform the operation he should do just what he pleased. She began to look around at her husband, but he was evidently one of those fellows who never have anything to say at home, and he took up his hat and went outdoors. Thirteen pints of blood! Gentlemen, there is no danger of bleeding to death from the extraction of a tooth.

Dr. ARNOLD had been very much gratified at the amount of discussion upon this subject. In reply to statements that have been made, he wished simply to state that he was absolutely and positively opposed to the use of pressure in these cases. It is unscientific. The analogy has been made between these cases and ordinary surgical operations, where bandages and pressure are put upon the bleeding wound. It is a very poor analogy. If you have an excessive hemorrhage in a tooth-socket which requires any treatment at all, you have a deep tube which, at least on two sides, is very thin. If you press down anything at all, whether it be cotton, gutta-percha, shoemaker's wax, or anything else, the harder you press down into the socket the more you spread it, which simply expands the wall and enlarges the rupture. Some of the worst and most uncontrollable hemorrhages he had ever seen, but which he could arrest by local applications, were cases where there was a tight plug in the socket and the blood was oozing out from the gum-tissue along the whole track of the alveolar line.

Now as a substitute for that pressure in the socket, if any compress at all is used, he should prefer a plaster of Paris compress. That presses the whole tissue evenly. It involves all the parts, outside as well as inside, and with the addition of internal treatment you can usually control those cases. Treatment by pressure is, it seemed to him, ridiculous. It simply transfers the lesion. It is just as bad as plugging an exposed pulp and then making a hole in the side of the pulp-cavity. You have a hole there, and you simply transfer the location of it. He has had the most gratifying results where he has proceeded gently. You may bandage an arm and stop a bleeding wound in it, you may arrest it perfectly; but in the tooth-socket you have a condition that you have nowhere else.

Now, in reference to gallic acid internally, so far as we know anything about its action,—and of course we know very little about how medicines act,—so far as we do know, gallic acid has the power to contract the blood-vessels. Another property which it has is the furnishing of fibrin, if that is the coagulating principle, which, as far as we know, it is. It furnishes an additional amount of fibrin to the blood, which makes its own plug. The best plug in the world is a clot of blood. That is the reason we apply the gallic acid. As to the danger of bleeding to death, or dying from alveolar hemorrhage, he has never known of any cases in his own practice or that of his immediate friends, but it is a matter of history that it has occurred. We must simply take the statistics of gentlemen who have written on these subjects, and this is a matter of history like everything else.

Dr. GEO. H. WILSON, of Cleveland, asked how long Dr. Arnold would leave the plug in the cavity or socket.

Dr. ARNOLD replied that he did not plug the socket at all. As stated in the paper, he used a gentle preparation,—tannic acid,—because it is harmless, and because it is a good astringent, as everybody knows.

Dr. WILSON. Without cotton?

Dr. ARNOLD. Usually when the socket is in the lower jaw, I take a little spatula and fill it with tannic acid and dump it in.

Dr. WILSON. Suppose it is in the upper jaw?

Dr. ARNOLD. I saturate a piece of cotton and press it in gently.

Dr. WILSON. How long would you leave it?

Dr. ARNOLD. Three or four or five or six days, if not uncomfortable.

Dr. WILSON. If you have secondary hemorrhage from the effects of the irritant, what then?

Dr. ARNOLD. I use gallic acid internally. If the hemorrhage persists, I use the gallic acid just as I have stated, which puts the blood itself into a condition to make its own clot.

Dr. WILSON. How long would you leave the plaster cast you speak of?

Dr. ARNOLD did not know, having never used it. But his opinion is, that if you must have a mechanical plug, if your wound is so deep, or if one of the larger arteries has been ruptured, and it makes a very ugly and complicated operation to go down there to squeeze it together or lacerate the points or to ligate it, he should use tannic acid in there and put plaster of Paris over it and leave it for a week if comfortable. It would be infinitely more comfortable than to bandage the jaws together; at least he should think so. He would leave it there a week possibly, certainly until he thought all danger was passed. The patient's physical condition would guide somewhat as to the length of time to leave it there.

Dr. WILSON. One great source of failure seems to be not properly diagnosing the conditions. The hemorrhage may appear in a short time, or a week or ten days or later, when there has been no tendency to hemorrhage before. If you discover that the hemorrhage is from the bony socket and not from the soft tissues, it would seem that to plug with a mild astringent is all that is necessary. But to apply this, it is necessary that the socket be thoroughly cleaned of the clotted blood and a new coagulant made; and then that we do not leave it so long as to produce secondary hemorrhage. Inside of twenty-four hours it should be removed, and for its removal, a syringe with hot water is all that is necessary; and when it is removed, perhaps a mild astringent upon the surface will be all that we need do. If the hemorrhage is from the soft tissues, we need a different application entirely. There is then a relaxed condition of the blood-vessels from some cause. Gallic acid is an astringent which acts upon the walls of the blood-vessels, and by administering it, we seek to overcome that relaxed condition. We should not over-treat our case. The worst cases he has ever seen have come from the hands of physicians, from over-treatment. We should avoid this, and use our judgment.

(To be continued.)

## UNION CONVENTION OF THE WASHINGTON CITY DENTAL SOCIETY AND THE MARYLAND STATE DENTAL ASSOCIATION.

(Concluded from page 803.)

### SECOND DAY—*Afternoon Session.*

THE convention was called to order at 2.30 P.M. ; Dr. C. C. Harris in the chair.

Dr. S. J. COCKERILLE, of Washington, read a paper upon the duties of dentists to dental associations and the advantages derived from association work. This was an excellent paper, and was received most favorably, but the author refused to allow its publication.

Dr. L. ASHLEY FAUGHT, of Philadelphia, read a paper, of which we present an abstract, entitled,—

### THE BENEFITS OF LAWS REGULATING THE PRACTICE OF DENTISTRY.

Dentistry during the last fifty years, and markedly during the last twenty-five, has passed through many conditions of change. To the consideration of one of these conditions your attention is now invited.

From one of the most unpromising and unsuspected sources it started, by the enactment of a dental law in the state of Alabama, in 1844. For nearly thirty years it rested dormant and unnoticed, but about the year 1868, New York appeared upon the scene and secured the enactment of a law. She was rapidly followed by Georgia, New Jersey, and Pennsylvania, for the bogus dental diploma traffic had then become so engrafted upon the United States as to make such steps almost imperative. Then it was that one of your own gifted countrymen, Professor Robert Arthur, published his famous articles on "Dental Education." The era was one of awakening in dentistry, and the movement thus started has never ceased. To-day, over forty states possess legal enactment. With such an experience confronting us, we do well to query, *cui bono?*

The presumption of the question is that there are benefits. Can there be any doubt, seeing that the possession of legal enactment is at present almost universal? Is it possible that the legislatures of state after state could be so far led into error as to enact successively that which was the wish of the few, and yet the result not be a direct benefit to the many? And yet we are so told. There are those who do not hesitate to charge that in no single instance have "the dear people" asked for legal dental protection ; but that the desire on the part of a few, banded together to declare themselves superior to others, and stimulated by a desire to hedge themselves in by barriers of exclusion, has been the successful cause of those enactments under which we rest. I have no hesitation in declaring that charge to be fallacious, and that the steps in dental legislation have ever been taken with "malice toward none, and charity for all." I make this statement advisedly, for a careful analysis of the subject will lead any one to a concurrence in that opinion.

The first intrinsic benefit, then, to the people, to the profession at large, to the colleges, and to the student, is the grand possession of legal enactment, for in it is reached the culmination of that bold step taken by the gentlemen of Maryland when they established the Baltimore College of Dental Surgery. This later legal chapter in history is but the fruition of their first step,—the establishment of dentistry as an independent profession. May the Baltimore College never go back on the stand she took, and the impetus which she gave the profession, and may the day come when every professor in every college throughout the land shall be a practicing dentist. This is not mere sophistry, no illusion, but an attainable stand, perfectly possible of realization.

Under legislative protective enactment, the profession has been elevated and a legal status obtained. It is unnecessary for me to go into detail to prove this statement, for there can be no question about the elevating character of all restrictive laws favoring higher educational standards and better qualifications ; but I do wish to ask you to note that a benefit, much to be desired,—a uniform standard of qualification to practice,—is now in process of being conferred on the profession. This will be the direct outgrowth of the second intrinsic benefit of laws regulating the practice of dentistry,—to wit, the establishment of state boards of dental examiners, and the formation of the National Association of Dental Examiners.

The second great intrinsic benefit of state laws enfolds a number of others hardly minor in importance, which may now be enumerated. To the work and influence of these bodies a twofold benefit may be traced, equally divided between the colleges and the students. Indeed, it is hard to say which reaps the greater advantage. The boards have by their work been the cause of raising the standard of collegiate instruction, both in the number of courses of lectures and the number of months involved in each course. To realize this effect of the recent dental laws (I mean those requiring an examination), you have simply to look at the work done by the colleges five years ago, and at the way the same colleges are conducted to-day ; they are not like the same institutions. They may not be improved, perhaps, financially, but there is no question about the improvement from an educational standpoint.

The existence of examining boards has made a preliminary examination necessary for entrance into colleges, thus weeding out those applicants of lowest development, and disciplining those who attain to that first step toward the degree of Doctor of Dental Surgery. The character of the men admitted to-day to collegiate training is in strong contrast to that of those admitted prior to legal enactment. They have even weeded out the colleges themselves, and harmonized the courses of instruction in those which exist.

The boards have made the possession of a diploma from one of the colleges recognized by the National Association of Dental Examiners almost an absolute essential to the obtainance of a right to practice. As the president of this organization, I have personal knowledge of how strenuous are the efforts of newly established colleges for our recognition, and how bitter are the complaints of those institutions debarred because of their failure to comply with our rules and regulations. To be with us they must be of us, and measure up to a high standard.

Now, before concluding, I wish to say a word on the benefits to the students. These, of course, are closely connected with those to the colleges, but the student, as a rule, does not realize what these laws are doing for him. A student presumably goes to college to get all he can for his money ; there are some, of course, who think they know it all beforehand, and they simply try to get through with as little exertion as possible. These laws have helped both,—to the real student the colleges have been forced to give more for his money, and to the other the examining boards have established a standard, up to which it has been necessary for the colleges to bring their graduates as a matter of self-preservation, while at the same time the boards have stood ready to rectify any slight errors that the faculties might make in passing, under stress of sympathy, an ineligible candidate for graduation. To see this matter in its true light, it is only necessary to look at the standing of the applicants who come up before the boards from year to year. In the last five years, in one state, at least, which has reported on the subject, the percentage of failures has been reduced from fifty to not more than ten, while the standard of examination has been constantly increased.

So much for the present benefits of laws regulating the practice of dentistry. I may be pardoned if I prognosticate for the future.

The trend of all laws lately enacted is to demand that all admitted to practice shall be examined by state boards, and I believe that the day is not far distant when that uniformity of laws now so desirable shall be attained, and no one will be able to enter upon practice after an examination by the professors of his own college alone. This will confer the benefit of eliminating the sad consequences of favoritism, of the registration of every dentist, and of the legal recognition of the rights of all in practice.

### *Discussion.*

Dr. R. Grady, of Baltimore, felt that it was better to give the discussion of the subject a local turn rather than to follow closely the ideas set forth in the paper. The effect of dental legislation in the state of Maryland has been to increase the number of students in the colleges, as every holder of a diploma from a reputable college has a legal right to practice in the state. As far back as 1879 (and, he thought, on motion of Dr. Keech) the subject of a dental law engaged the attention of the Maryland and District of Columbia Dental Association, and in 1884 the first law in this state was passed. This law restricted the privilege of practice to those who graduated in this state. This was protested against, and after two years it was changed to limit the privilege to residents, and to give the board the right to pass upon the qualifications of graduates. These amendments were prepared by a committee of the state association, and were accepted by the legislature without change.

We should begin now to perfect a bill to place before the legislature in 1896. In discussing the features of a new law, there are three points that will come up for decision: What we want, why we want it, and how to get it. We first want to rid the present law of imperfections. In this state, all graduates in medicine and pharmacy have to pass an examination before they are admitted to practice. Whether it is or is not advisable for dental graduates to pass an examination after the college has granted the diploma, is a question for discussion. Such examination would almost certainly make the colleges more particular in granting their diplomas. The aim of all dentists should be to teach the people that dentistry is not a mere art, but that it is a profession, and that those who practice it have a thorough education to fit them for a professional life. As to the way to get those changes in the law which we feel are needed, the best way is to have a competent committee appointed by the State Association to carefully study the subject and decide what changes are needed, and then, their report having been favorably received by the association, to go before the legislature prepared to show that the law with the proposed amendments would be beneficial to the people, and, further than that, that there would be nothing unconstitutional in the measure. In his own judgment, there should be a provision that all candidates for practice, besides presenting a diploma from a reputable college, should pass an examination before the State Board of Dental Examiners, all questions and answers to be in writing, and to be preserved a reasonable time for reference, should it be necessary to refer to them. All members of the State Board of Dental Examiners should be graduates of reputable colleges. Reputable dentists, residents of other states, should be allowed to attend to individual cases in this state, and money paid to illegal practitioners should be recoverable by civil action at law.

Dr. A. W. SWEENEY, of Washington, thought there was no question as to the propriety and utility of laws to regulate the practice of dentistry, or their necessity, but at the same time he was convinced that there was no dental law in existence not subject to criticism. He had been studying the subject of dental laws for some time, and felt that he had a fair idea of the status of dental legislation all over the world. He feels that many of the laws are inspired by wrong motives, their aim not being to protect the people from incompetent practitioners, but to arm the profession against the competition of the skilled dentists from other states who might become dangerous competitors in their own field.

With regard to our own laws, we should make it our effort to uphold the standard of education in the colleges, so that students would not fear any subsequent examination; and whether the colleges or the examiners grant the degree, it should give the recipient the right to practice in any part of the United States. When it does that it will go farther, and receive recognition in other countries.

The boards which grant the license to practice, too, should have the power to revoke the same.

Dr. B. HOLLY SMITH, of Baltimore, said that those who had never gone before a legislature to get a law passed little realized how difficult it was to get anything done. There was always opposition, and every law passed was inevitably a compromise. To have uniform laws throughout the states would be, no doubt, desirable, and, in order to make a step in that direction, he gave notice that in the next regular meeting of the Maryland State Dental Association he would move that a committee be appointed to draft a law for the state of Maryland,—as nearly an ideal law as possible,—with the hope that other states will adopt it : the law to allow a dentist legally competent to practice in any state the right to practice in this state upon registration.

Dr. WM. A. MILLS, of Baltimore, thought that the clause in a state law which debarred from practice in any state one who was legally qualified to practice in any other state was unconstitutional, and, if carried to the Supreme Court, would be so declared.

Dr. WILLIAMS DONNALLY, of Washington, said that a perfectly analogous case had been tried and carried to the Supreme Court of the United States, and the law had been declared constitutional, and this decision had settled the constitutionality of such laws.

Dr. FAUGHT, being asked to close the discussion, thanked the two societies constituting the convention for the courtesy with which they had heard the paper, but declined to prolong the discussion.

Dr. A. J. VOLCK, of Baltimore, chairman of the Section of Mechanical Dentistry, spoke of the advance made in mechanical dentistry in recent years ; much greater than in any other department. The filling of teeth years ago was about as it is now, but restorative dentistry has made immense advances. Fifty or sixty years ago people who were old, or even middle-aged, had sunken jaws, their lips were fallen in, and their voices muffled, because the natural teeth lost could not be restored. In these days the dentist has changed all this, and the appearance of old age has been put off. Not only has the appearance been improved, but the health is preserved, strength retained, and life lengthened, by better artificial dentures than could be supplied in former times, and the price for the same is so low that their use is almost universal with those who need them. He gave a sketch of the invention and improvement in the manufacture of porcelain teeth, the introduction of vulcanite and celluloid, which he considered a period of decadence in the dental art, as the most ignorant and unskillful could satisfy the masses of the people with them as well as the better-qualified dentist. The introduction of crown- and bridge-work was one of the greatest advances made since the manufacture of porcelain teeth began, as no work the dentist does requires a higher grade of skill or more study than bridge-work, and none gives more satisfactory results when properly done. Concluding, he said that mechanical was as honorable as any other branch of dentistry, if not more honorable, and that much more attention should be given it.

There was no discussion on Dr. Volck's address, and the convention adjourned to meet in Washington next year.

# AMERICAN MEDICAL ASSOCIATION—SECTION ON ORAL AND DENTAL SURGERY.

(Concluded from page 807.)

## THIRD DAY—*Morning Session* (Continued).

DR. W. X. SUDDUTH described two cases of suppuration of the intermaxillary bone, with treatment. He advocates the cutting away of the diseased bone with a rapidly revolving bur, and then packing the cavity with an antiseptic substance. He formerly used cotton saturated with an antiseptic, but prefers now a paste made of sulfite of zinc and vaseline, lanolin, or gelatin, a ten per cent. mixture. This will dissolve slowly by liberating the sulfite of zinc, and will last about thirty-six hours. After this the pocket is washed out freely with pyrozone, as the locality is exceedingly vascular, and the wash must be penetrating. Pyrozone has more good qualities for such a wash than any other drug ; it is almost a specific.

Dr. J. L. WILLIAMS, of Boston, said he had come to the conclusion that cotton was one of the most active materials in the absorbing of offensive matter that there is, and he used in its stead antiseptic wool. The use of sulfite of zinc he thought was a very good suggestion.

Dr. WM. S. SHERMAN, of Newport, R. I., had been interested in such cases for several years, and was glad to have heard the cases reported. He felt that the point made of packing the cavity immediately after the operation was a good one ; unless this were done there would be difficulty in making the examination at the next visit. He used iodoform gauze instead of cotton, and thought this better than to use a solid substance, as described by Dr. Sudduth.

The subject was passed, and the section adjourned to meet at 2.30 P.M.

### *Afternoon Session.*

The section was called to order at 2.30 P.M., and on motion the papers read by Drs. Eames and Twilley were taken up for discussion.*

Dr. E. S. TALBOT, in speaking of the paper read by Dr. Eames, said there was an underlying condition, which was a factor in the production of such irregularities, of which Dr. Eames did not speak ; this condition is degeneracy. Every case of adenoid growth will be found to be a case of degeneracy, as shown by the want of development in the bones of the face and the jaws. This is also true of every case of irregularity in the teeth. That one of these affects the other he did not believe. The idea that the contraction of the dental arch was due to mouth-breathing was absurd ; there is just as little chance of this arch being broken by external pressure as a brick or stone arch. The term "high arch" is a mistake. There is no high arch, but the contraction of the jaw makes the arch appear high. In one of Dr. Twilley's cases there was an excess of development in the upper jaw, and a lack of development in the lower. To correct this the upper bicuspids were extracted when the lower jaw should have been expanded, as it could easily have been done, as the teeth were extracted when the child was thirteen years old, and the jaws continue to grow till about twenty-six years of age.

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* Abstracts of these papers were published in the DENTAL COSMOS for August, pages 701 and 707.

There is no subject in the treatment of irregularities of which we are so ignorant as the etiology. Dr. Kingsley and others have said that they do not care for the etiology of the condition while they can correct the irregularities. But we will never be able to cure the deformity with satisfaction to ourselves until we understand the causes which bring it about.

Dr. M. H. FLETCHER, of Cincinnati, said his study of diseases of the antrum, assisted by the examination of five hundred crania, led him to the conclusion that diseases of the antrum are due to nasal disease more frequently than to any other cause. Disease of the antrum is so frequently brought to the dentist for treatment that every dentist should be interested in its study.

Dr. EAMES agreed with Dr. Talbot with regard to the connection between degeneracy in the individual and nasal and antral troubles, but we should make a distinction between the arrest of development in turbinated bones and the hypertrophy of turbinated bodies; these swollen turbinated bodies can be seen, and the swelling becomes worse upon slight provocation, as changes in the atmosphere, etc. He had stated in his paper that sixty per cent. of all adenoid cases have nasal catarrh. It has been stated by Dr. Lenox Brown that all cases of adenoid growths were accompanied by nasal catarrh. Now, does not this show that the presence of the adenoid growth, which is covered by secretions and highly inflamed, would tend to cause the inflammation to extend over the excessively nervous and delicate membranes to produce catarrh?

Dr. W. A. TWILLEY, closing the discussion, thought they were generally in accord in holding not that mouth-breathing caused the nasal closing, but the reverse; if children could be taught to persistently breathe through the mouth, they would avoid this trouble and, in consequence, much of the catarrh which was so common.

Discussion closed.

Dr. W. G. A. BONWILL gave an address upon the subject of anesthesia, introducing and describing his method of producing anesthesia by rapid breathing.

Dr. W. X. SUDDUTH said he had had experience with the production of anesthesia, or rather the analgesic condition, by means of rapid breathing in connection with suggestion, and wondered that more dentists did not avail themselves of this method. He could by suggestion and rapid breathing keep up the analgesic condition for an hour and a half or two hours. Sometimes he uses drugs or gas, and, by suggestion, prolongs their apparent action for a long time. It will succeed in fully ninety-five per cent. of cases, and by learning to practice this method, work can be done with much more comfort to both the operator and the patient than in any other way. The patient must relax his muscles and place the hands in the lap; then tell him that the effect will first be in the hands, and extend from the extremities up to the body, and he will soon be in a state in which, while being fully conscious and able to assist you, he will suffer no pain. The keynote of the successful method is to keep confidently talking to the patient. If necessary, occasionally give a few whiffs of gas, and so continue the state as long as necessary. Nitrous oxid, formerly called laughing gas, given with suggestion will be laughing gas, instead of showing the terrifying symptoms of asphyxia so often seen. His practice of this method goes as far back as 1879, his first knowledge of it having come from Dr. Bonwill.

Discussion closed, and the secretary introduced Dr. R. R. Andrews as the chairman for next year, after which the section adjourned.

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## NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

THE thirteenth annual session of the National Association of Dental Examiners was held at Asbury Park, N. J., commencing Monday, August 5, 1895; the president, Dr. L. Ashley Faught, of Philadelphia, in the chair.

The following state boards were represented at the sessions:

*Alabama*—T. P. Whitby.
*Delaware*—C. R. Jefferis, D. M. Hitch.
*Georgia*—J. H. Coyle.
*Iowa*—J. T. Abbott.
*Kentucky*—H. B. Tileston.
*Kansas*—J. O. Houx.
*Colorado*—R. B. Weiser.
*New Jersey*—F. C. Barlow, Chas. A. Meeker, Geo. E. Adams, E. M. Beesley.
*Pennsylvania*—Louis Jack, W. E. Magill, L. Ashley Faught, Jesse C. Green.
*Tennessee*—F. A. Shotwell.
*Virginia*—J. Hall Moore.
*District of Columbia*—H. B. Noble, Williams Donnally.

The following boards were elected to membership:

*Connecticut*—Geo. L. Parmele.
*New York*—Wm. Carr.
*New Hampshire*—Edward B. Davis.

A resolution, offered by Dr. Barlow, requiring credentials to the association to bear the official seal of the state board making the application, was adopted.

A resolution offered by Dr. Donnally last year, and laid over, permitting persons who have been delegates to the association to be associate members without the right to vote or hold office, was taken up and adopted.

Dr. JACK offered the following, which was adopted:

> *Resolved*, That this body would express to the Association of Faculties the importance of an examination of the equipment, methods, and facilities of instruction of all the dental colleges of this country; it being understood that such examination is to be purely in the interest of higher educational standards and toward an approach to ultimate uniformity in the curriculum and methods of the schools, and more particularly to enable safe action to be made with respect to new schools.

Later a communication was received from the secretary of the National Association of Dental Faculties to the effect that the association had ordered the secretary to secure information from the various colleges regarding their equipment and general facilities for teaching; that this information would be systematized so as to be available at the next annual meeting of this body.

The following "plan of requirements for the recognition of dental schools," offered by Dr. JACK, was adopted, with a proviso that it shall apply only to colleges making application after the close of this session :

> That each dental school which may in future come before this board for recognition, must have a teaching faculty composed as follows, to wit : at least three professors of dental subjects, namely, for operative dentistry, for dental prosthetics, for dental pathology and therapeutics. For the medical subjects there must be at least five professors, namely, for anatomy, for physiology, for chemistry, for pathology, and for materia medica.
>
> Its students must also be taught the subjects of chemistry and bacteriology in laboratories adapted to the purpose and under suitable instructors.
>
> That such special school must possess, in addition to suitable lecture-rooms, a well-appointed dental infirmary and a general prosthetic laboratory ; also each school must be provided with a room or rooms suitable for manual training in operative dentistry, and must furnish in this way systematic instruction to its students.
>
> All of these provisions are to be determined by careful inspection on the part of the Board of Examiners of the state within which is located the school, or other authorized body duly indorsed by this association. And upon the result of this examination may depend the question of reputability.

The following colleges were added to the list of recognized schools : Dental Department of the University of Denver, Denver, Col. ; Department of Dentistry of Detroit College of Medicine, Detroit, Mich. ; Dental Department of Western Reserve University, Cleveland, O.

Applications from the following were laid over one year : University of Buffalo, Dental Department ; Atlanta Dental College ; University College of Medicine, Dental Department, Richmond, Va. ; Birmingham Dental College ; Cincinnati College of Dental Surgery.

The Committee on Colleges in its report, which was presented by its chairman, Dr. JACK, expressed the view that more should be required to establish the right of dental schools to recognition by this body than good organization and the fulfillment of the rules of the Association of Faculties. Evidence should be furnished that the teachers are of high standing ; that they require of their matriculates the stipulated preliminary training, and that they are carefully qualifying their students in every necessary direction. To ascertain these facts is a matter of difficulty. It is necessary, too, in addition to an ascertainment of the character of the faculties of any school, to discover the degree of confidence which has been developed in the minds of the local members of the profession.

The number of students in actual attendance in all the schools of the country for the session 1894–95, excluding those attending special courses, was 4979, as against 3997 at the previous session ; graduates 1208, as against 911.

The committee also expressed the conviction that it is becoming evident that the dental schools are increasing in number beyond the needs of the public, owing to the tendency of medical schools to inaugurate dental departments. The installation of dental departments in connection with medical schools is necessarily often incomplete, and therefore the committee believes that restrictions should be placed upon the rapid increase of inefficient dental colleges. As the practice of dentistry is largely based upon knowledge of chemistry and bacteriology, and as manual training has become an integral part of the curriculum of some of the better schools, we recommend that the association do not in future recognize any school unless satisfactory evidence is furnished that the students of such schools applying for recognition are being taught in modern chemical and bacteriological laboratories, and are also furnished with every convenience for manual training in prosthetic and operative dentistry, and that this latter mode of practical instruction is systematically carried on in at least the first year's course.

The committee also called attention to the importance of a higher standard of preliminary education, and to the impropriety of schools advertising as instructors practitioners who occasionally clinic before the students, but are not a part of the staff of the institution.

The report was adopted.

The following resolution, offered by Dr. MAGILL, was unanimously adopted:

> *Resolved*, That we will not in future consider favorably an application for recognition from any college which has as a member of its faculty one who also holds membership in the State Examining Board.

Dr. DONNALLY moved that final action shall not be taken on the application of any college until such application has been in the hands of the chairman of the Committee on Colleges for at least ten months. So ordered.

The following were elected officers for the ensuing year: J. T. Abbott, Manchester, Iowa, president; H. B. Noble, Washington, D. C., vice-president; Charles A. Meeker, Newark, N. J., secretary and treasurer.

Adjourned.

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## NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE twelfth annual meeting of the National Association of Dental Faculties was held at the Ocean Hotel, Asbury Park, N. J., commencing Saturday, August 2, 1895; the president, Dr. Frank Abbott, in the chair. The entire membership of the association was represented at this meeting as follows:

*University of California, Dental Department*—L. L. Dunbar.
*University of Denver, Dental Department*—R. B. Weiser.
*Columbian University, Dental Department*—J. Hall Lewis.
*National University, Dental Department*—J. Roland Walton.
*Southern Medical College, Dental Department*—Frank Holland.
*American College of Dental Surgery*—Louis Ottofy.
*Chicago College of Dental Surgery*—Truman W. Brophy.
*Northwestern College of Dental Surgery*—J. A. Whipple.
*Northwestern University Dental School*—George H. Cushing.
*Indiana Dental College*—George Edwin Hunt.
*University of Iowa, Dental Department*—A. O. Hunt.
*Louisville College of Dentistry*—Francis Peabody.
*Baltimore College of Dental Surgery*—M. W. Foster.
*University of Maryland, Dental Department*—F. J. S. Gorgas.
*Boston Dental College*—J. A. Follett.
*Harvard University, Dental Department*—Thomas Fillebrown.
*Dental College of the University of Michigan*—J. Taft.
*Detroit College of Medicine, Dental Department*—G. S. Shattuck.
*University of Minnesota, College of Dentistry*—Thos. E. Weeks.

*Kansas City Dental College*—J. D. Patterson.

*Western Dental College*—D. J. McMillen.

*Missouri Dental College*—A. H. Fuller.

*University of Buffalo, Dental Department*—W. C. Barrett.

*New York College of Dentistry*—Frank Abbott.

*Ohio College of Dental Surgery*—H. A. Smith.

*Western Reserve University, Dental Department*—H. L. Ambler.

*Pennsylvania College of Dental Surgery*—C. N. Peirce.

*Philadelphia Dental College*—S. H. Guilford.

*University of Pennsylvania, Dental Department*—James Truman.

*Meharry Medical School of Central Tennessee College, Dental Department*—G. W. Hubbard.

*University of Tennessee, Dental Department*—J. P. Gray.

*Vanderbilt University, Dental Department*—Henry W. Morgan.

*Royal College of Dental Surgeons of Ontario*—J. B. Willmott.

The following colleges were admitted to membership :

*University College of Medicine, Dental Department, Richmond, Va.*—L. M. Cowardin.

*Atlanta Dental College*—Wm. Crenshaw.

*Birmingham Dental College*—T. M. Allen.

*Cincinnati College of Dental Surgery*—G. S. Junkerman.

*Cleveland University of Medicine and Surgery, Dental Department*—S. B. Dewey.

The following, laid over under the rules from last year, were adopted as here given :

*Resolved*, That in view of the recommendation of the Executive Committee that this association now in session shall require that all colleges, members of this association, shall extend the term of the session of 1896–97, and of succeeding sessions, to not less than six months each ;

Beginning with the session of 1895–96, no college shall be permitted to retain membership in this association if it is conducted or managed, in whole or in part, by any person or persons who do not practice dentistry in accordance with well recognized and generally accepted forms, generally known as dental ethics, or if they are owned in whole or in part by men or women who are engaged in disreputable dental practice, or if any college have upon its list of trustees, the faculty, demonstrators, or in any other capacity, any one who does not practice dentistry in accordance with the principles above mentioned. This shall refer to dentists only ;

Beginning with the session of 1896–97, the examinations conducted by the colleges of this association shall be in the English language only.

The other resolutions which came over from last year for action were laid on the table.

A resolution was adopted requiring each college holding membership in the association to file with the secretary sixty days before the next meeting a detailed statement of its equipment and facilities for teaching ; all new applicants to file a similar statement with their applications. The secretary was instructed to have blank forms printed for the purpose and forwarded to the various schools.

The report of the special committee on preliminary examinations was received and the committee discharged.

The following resolutions offered by Dr. Patterson were adopted :

*Resolved*, That students in attendance at colleges of this association are required to obey the laws regulating the practice of dentistry in the various states, and failing to do this, shall not again be received into any of the colleges of this association ;

*Resolved*, That when a college of this association has increased the cost of tuition fees, no student shall be received at the former fee except those who have matriculated at such college prior to such action.

The Committee on Text-Books reported in favor of the adoption as text-books by the colleges of the association of two works, namely, "Dental Anatomy," by G. V. Black, M.D., D.D.S., and "Methods of Filling Teeth," by Rodrigues Ottolengui, M.D.S. The report was adopted.

The following lie over until next year :

Amendment to the rules offered by the Executive Committee :

That each college be allowed two delegates, and be limited to one vote for each school.

By Dr. Peabody :

That when a student who has matriculated within the time limit in any recognized college shall, from sickness, death or sickness in family, lack of funds, or other reasonable cause be compelled to retire from that college before the expiration of the term, he may be allowed to make up the deficit of time in the same or any other college (provided he enter at a date not later than that on which he retired), be examined by the last college entered, and if the examination be up to the requirements of that college, and otherwise satisfactory, may be given tickets for advanced standing or graduated, as the case may be.

By Dr. George Edwin Hunt :

Amend the last portion of Rule 3 to read as follows :

"Except on such conditions as would have been imposed in the original school, and these to be ascertained by conference with the school from whence he came."

By Dr. Gray :

Moved that when students from one college apply for advanced standing to any other college of this association, it shall be the duty of the dean or secretary of the latter college to ascertain by correspondence with the college from which the student comes if there be any objection to his acception.

By Dr. Gray :

*Resolved*, That all colleges of this association shall charge not less than one hundred dollars tuition each session.

By Dr. A. O. Hunt :

*Resolved*, That a student who is suspended or expelled for cause from any college of this association shall not be received by any other college during that current session.

In case the action of the first college is expulsion, the student shall not be given credit at any time for the course from which he was expelled.

Any college suspending any student shall at once notify all other members of this association of its action.

The following resolution offered by Dr. Ottofy was adopted :

*Resolved*, That the indorsement of applications for membership, made during the coming year, shall be based upon definite knowledge obtained by a careful examination of the methods of teaching, the equipment, and the efficiency of the Faculty.

The report of the committee on revision of the constitution, laws, and codified rules was considered section by section, and laid over for final action next year; and the committee, consisting of Drs. Louis Ottofy, A. O. Hunt, and J. D. Patterson, was continued.

The following were elected officers for the ensuing year: S. H. Guilford, president; Geo. H. Cushing, vice-president; Louis Ottofy, secretary; Henry W. Morgan, treasurer; J. Taft, Thomas Fillebrown, B. Holly Smith, executive committee; H. A. Smith, A. O. Hunt, and T. W. Brophy, ad interim committee.

The newly elected officers were installed and the president announced the standing committees as follows: J. A. Follett, L. L. Dunbar, Geo. Edwin Hunt, C. N. Peirce, and T. W. Brophy, committee on schools; J. D. Patterson, A. O. Hunt, J. B. Willmott, T. E. Weeks, and J. P. Gray, committee on text-books.

Adjourned to meet at the call of the Executive Committee.

## AMERICAN DENTAL ASSOCIATION.

(Continued from page 785.)

### FIRST DAY—*Evening Session* (Continued).

DR. THOMAS FILLEBROWN, Boston, could not pretend to add anything to the strength of the paper read by Dr. Stainton, as it crystallizes a sentiment which is rapidly growing. There is an impression quite generally extant that it is within the power of the Faculties Association to prevent the establishment of more dental schools. A church organization has a potent power over the establishment of new congregations, where it is called on to pay the bills; but the National Association of Dental Faculties doesn't have to pay the bills for the establishment or carrying on of new dental colleges, and it cannot prohibit their being. The association has not a particle of power over the matter.

The tables presented by Dr. Stainton do not consider the irregular physicians, and there are probably many more than the paper takes note of. The speaker thinks that the number of graduates from year to year is not enough to supply the normal increase in the need for dental services, and that consequently the market is not overstocked. There seems to be an idea that it is a great hardship on the graduate of a dental college to declare that his diploma is good only in his own state, and that he must be examined if he wishes to practice in another state. We have in the state of Massachusetts a law for the dentists, a law for the lawyers, and, the speaker thought, for the medical men also. Every graduate of Harvard Law School must be examined by the courts' examiners before he is admitted to practice. He wished that a law compelling a man to be examined as to his fitness to practice dentistry might prevail in every state.

Dr. JAMES McMANUS, Hartford, Conn., detailed at some length difficulties which he, with other of the practitioners of his state, met in defeating a bill introduced into the legislature for the incorporation of a dental college. The Board of Examiners knew nothing of the movement, and there were not twenty dentists in the state who did. In the course of the investigation they learned that the reason why the bill was so strenuously pushed was that one of the incorporators was a friend of the member who was managing it. One of the incorporators stated that any medical man could teach dentists anatomy and pathology. The bill got through the house twice, but was finally stopped in the senate. The dentists opposed the bill only because they knew there was no necessity for such an institution in the state, and because the state had a clean record on dental legislation and they wished it to remain clean.

Dr. C. S. STOCKTON, Newark, N. J., said that Professor Buckingham used to say, "We do the best that can be done with the material sent us." That may have been true in his day, but Dr. Stockton doubted its accuracy to-day. Cannot the colleges turn out gentlemen? You know that all over the country men are advertising that they will supply the best set of teeth that can be made, for five dollars. Dr. Stockton believes that the colleges can do much to remedy this state of affairs. If a graduate does these things, let the college which conferred his diploma recall it. To-day the graduate who is disposed to act dishonorably hangs his diploma on his office wall and says, "I can do as I please." If the colleges would put a brand on such acts, they would cease.

Dr. M. L. RHEIN, New York, deprecated the placing of restrictions on men entering the profession. How are we going to elevate the profession if we put up a Chinese wall to keep out the candidates? He challenged the proof that the figures adduced in the papers showed enough dentists to meet the demand for dental services. The natural increase in popular education upon dental subjects will enlarge the need for dentists, and he believes the colleges will not turn out too many dentists. It would be one of the worst blots on this association to have it go out to the world that it adopted the phase of this question which has been advocated. The trouble is not that there are too many dentists, but that there are too many poor dentists. It would do no good to prescribe an oath as of old in medicine. The way to improve the status of the profession is by the establishment of better colleges than we now have.

Dr. J. FOSTER FLAGG, Philadelphia, considered the subject as of the greatest moment to the profession, and the entire time of this meeting could not be better spent than in a thorough ventilation of this question. The papers that have been read have influenced every one who heard them in one way or another, but they all tend to one end. A house divided against itself cannot stand; with him (Dr. Flagg) dentistry is first all the time. Dr. Jack says there is a great danger threatening our profession. What is our profession? Are we united in regarding ourselves as a profession? A very few minutes after Dr. Jack referred to the great danger threatening "our profession," he spoke of the great facilities which universities have to educate men for "our specialty." There is the rock we split on. All of us want a wider education for students of dentistry; all of us want the colleges to turn out their graduates as gentlemen. A university can educate men for the dental profession, but not through medical physiology. There is a twofold idea in this matter of teaching dental students. Those engaged in teaching want good classes because they want to be paid for their work; for himself, he should not stay long in the harness unless there was a reasonably large class, and there are scores of others working on the same lines. We want good classes, because we want good pay. Then we want to so train the students that they shall be able to pass the state boards anywhere. That is the effort of every teacher worthy of the name. For himself, he had not been one of those who looked sidewise at the state boards; rather he had endeavored to back them up, because he thought them to be the foundation of progress in the profession. He does not believe it is possible to make a profession as a tail-end to medicine. There is too much in dentistry itself for that. He challenged any man to say, "I know everything there is to know about dentistry."

Dr. C. P. LENNOX, Toronto, thinks that the difficulty is more with the people than with the schools. It is a difficult matter to educate the people to a proper appreciation of what dentistry is and does. He believes in the thorough education of the dentist; we cannot do too much in that line. But there is that other element which has to be considered,—the people. Nine out of ten of them will go to the man who advertises his superiority over his fellows. The remedy is, of course, to educate the people to take their stand with the educated dentist, but the fact is that the great mass of the people are not educated in this regard, and very often even intelligent persons will go to this or that dentist who advertises that he will perform operations without pain. We have been trying a good many years to better this condition of affairs, but we do not seem to have accomplished much. You know that only a few years ago it only took a few months of tuition to make a dentist, and now the memory of this facility returns to plague us.

Dr. E. A. BOGUE, New York, agrees mainly with what Dr. Flagg has said, but he has asked himself why these papers were read before this association, and the answer which came was, because this association has weight. He had been deeply impressed with the figures presented by Dr. Stainton; also with the fact noted that men who cannot speak English correctly are made Doctors of Dental Surgery. It is in vain to ask the colleges to recall their diplomas when granted to unworthy recipients, unless there is a great moral weight behind the request. This association called into existence the National Association of Dental Faculties. There is a body which we can influence and which can have great weight in this matter. Between the National Associations of Examiners and Faculties the end aimed at can be accomplished; but in order to make their action effective our moral weight must be behind them. If the National Association of Dental Examiners have one standard of education, the colleges which have done their duty can safely consign their students to them for examination, and the various states can safely accept certificates one from another. The new New York state law is most illiberal in some of its provisions, although it was honestly formulated in the effort to raise the standard of dental education. If this body will give its moral weight to help the National Association of Dental Examiners to formulate the standard, there can be no doubt of the outcome.

The further discussion of the papers was postponed until the next session.

Adjourned to 9 o'clock Wednesday morning.

### SECOND DAY—*Morning Session.*

The association was called to order at 9.45 A.M., by Vice-President Watkins.

A communication from the Dental Society of the State of New York, with reference to the use of secret anesthetics by dentists, was read by the secretary, and referred to the section on Materia Medica, which at a later session reported the resolution printed in the DENTAL COSMOS for September, page 786.

Dr. H. J. MCKELLOPS, St. Louis, Mo., called for the reading of the resolution discountenancing the allowing of the use of their names by members of the profession to printed indorsements of therapeutic agents, which was adopted on his motion at the meeting in Boston, in 1880, and presented some more printed certificates in the line of those he had offered in support of that resolution. In his opinion it is about time we stopped the practice of giving certificates for materials used in the practice of dentistry. He himself had been in practice fifty years, and had never attached his name to a certificate. He was not a graduate in course from any college, but along in the '50's he had an honorary degree conferred upon him by the Ohio College of Dental Surgery, and he had never disgraced the college in that manner, at least.

The discussion on the papers presented by Section II was then resumed.

Dr. STAINTON thought it unfortunate that the matters presented in the paper he had read had not been more fully discussed. He therefore wished to reiterate some of the things which should not be lost sight of. With regard to the growth in the number of dental schools it should be borne in mind that it is easy to manufacture a dental school, but to manufacture a good one is quite another matter. The remedies for the present state of affairs which he had suggested, he believed would help to cure them. He had more faith in the faculties of the colleges than they seemed to have in themselves, and he does not think it is too much to ask that they insist on their permission being given as a necessary preliminary to the starting of a new school. Dr. Fillebrown's remarks are not pertinent to the case. Every one of the churches referred to secured the permission of the governing body of its denomination before it set up for itself. We are not assuming jurisdiction over other denominations when we insist that those intending to establish new schools for the teaching of dentistry shall first obtain the consent of the Faculties Association. The data upon which he had based his calculation of the average number of patients treated in a year in dental practice were necessarily inconclusive, because of the small number of replies he had received to his requests for information upon this point. If one hundred would carefully go over their records for two or three years, and send him the number of patients they had treated in that time, the information would afford a fair basis for calculation ; but if only twenty-five would do so, it would be of but little use.

Dr. CROUSE thought he could suggest a remedy, and that is to not allow the colleges to charge a fee for the operations performed in their infirmaries. Many of the questionable institutions start out with the advertisement of a "dental infirmary" or "dental college" by practitioners desirous of attracting business; then, in a year or two some one buys in the plant and starts lectures, and we have a new candidate asking admission into the Association of Faculties. Just as in politics, these things after awhile right themselves; but in the mean time the profession suffers. It may be well to look into this matter of infirmary fees from the business side. It is well for the colleges to have a revenue, but it should not come from the infirmary, where the work is supposed to be done for merely nominal charges.

There is another proposition suggested by Dr. Stainton's paper which merits thought. Less than five thousand of the dentists of the country are connected with the societies. The question is how to get out the other nineteen thousand and have them join in the society work. There are plenty of good men practicing dentistry who are outside of the societies, and what is needed is to broaden out in the society work so as to get them into it.

Dr. JACK. The general purpose of the second paper is to make apparent the necessity for much care in the recognition of new schools. This is required to bring about in the future a higher level of dental education than the present average. To aid in this, the National Association of Dental Examiners have formulated for their guidance rules which provide that a dental school asking for recognition must have a teaching faculty of at least three professors of dental subjects, namely, operative dentistry, dental prosthetics, and dental pathology and therapeutics; at least five professors of medical subjects, namely, anatomy, physiology, chemistry, pathology, and materia medica; its students must be taught chemistry and bacteriology in laboratories adapted to the purpose and under suitable instructors; it must possess, in addition to suitable lecture-rooms, a well-appointed dental infirmary and a general prosthetic laboratory, and a room or rooms suitable for manual training in operative dentistry, in which its students must have systematic instruction; compliance with these provisions to be determined by the state board of dental examiners of the state in which the college is located.*

These put into force must necessarily qualify for the better the general average, and also have an effect upon the present schools which are below the average. Even the school of the gentleman who held up to ridicule the author of the second paper will feel this influence; and were he and the writer of that paper permitted to return, years after their ashes have been gathered up, they would either find his school not in existence, or so changed in condition that they would not be able to recognize it.

Dr. L. D. SHEPARD, Boston, expressed his approval of the suggestion of Dr. Crouse, which, he believed, offered the true solution of the difficulty. The impression is given out, if it is not stated plainly, that what is charged in the infirmary as fees is to cover the cost of material used. That is the idea expressed or implied by most or all of them. If this is a fact, the colleges are practically telling falsehoods all the time. What is the cost of the material used in an oxyphosphate or amalgam filling? Is it customary to charge a nominal fee for this, or is not the lowest charge for a filling of this character in many of the infirmaries at least twenty-five cents? A charge of five cents would be ample to cover the cost of the materials, and the remainder goes to profit. Some years ago the speaker had presented in a paper which he read some figures showing the charges made in different schools for gold fillings. One college charged seventy cents a leaf for gold foil, and served No. 3. Another charged forty cents, which was a fair price for No. 4 foil, which it used. If it is a fact that there is a universal impression that the charges in the college infirmaries are only to cover the cost of the materials used, all of us know whether it is true or not. If the infirmary is a source of large revenue to the college, say ten or fifteen thousand dollars a year, as has been said, then the solution offered by Dr. Crouse is admirable, and will meet the case. The question has been often asked why we have not been freely granted the rank we claim, either as a liberal profession, or as a specialty of one. The reason is, because we have not been liberal in our service. We have not in all the land a single purely dental hospital. Where is there a dentist who gives up even a half-day a week to the poor? Every town of twenty-five thousand inhabitants has its hospital, where the medical men give a portion of their time free to benefit the needy. When we can look the medical men in the face, and say to them that the abilities of the best of us are at the service of the poor, we shall be accounted a liberal profession. At the suggestion of the speaker, a committee was appointed for the late congress, to consider the question of the "Care of the Teeth of the Poor." This question must be met, and he hoped to see the day when we should arrive at its solution.

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* These rules will be found in full in the report of the annual meeting of the National Association of Dental Examiners, current number.

Dr. JAMES TRUMAN, Philadelphia. There is not a year in the history of dental education that somebody has not assailed the conduct of the colleges of this country. When a man stands up before the great representative body of dentists and says that there is not a dental college in the land that is not a fraud, it is time to stop and consider what we are doing. The charge that the dental colleges are making large sums of money annually out of their infirmary practice, which is supposed to be largely gratuitous, is not true,—at least it is not true of the school with which the speaker is connected, and, he believed, not true of the majority of them. They are doing a great service for the poor in caring for their teeth at the lowest possible cost. It is a disgrace to this body that its members will sit and listen to such charges, made in a general way, against the institutions which have been building up dentistry for forty years. There is one thing which must be borne in mind in connection with this matter of caring for the teeth of the poor, and that is that you cannot get at the very poor. The exigencies of their lives are such that they have not the time to come to the infirmary,—cannot spare it from the necessities of earning their living. Those who do come must frequently wait for three or four hours to be served. Again, there can never be any comparison of the dentist with the medical man in the matter of gratuitous service to the poor, because of the total dissimilarity of the services which each has to perform.

Dr. H. A. SMITH, Cincinnati, O., said that the dental institution with which he is most familiar does have hospitals in which it does gratuitous work. It treats the teeth of the children in charitable institutions without pecuniary reward, and sometimes even pays their bills in the hospitals. He only spoke of the matter to show that the colleges, some of them, at least, are doing real charitable work for the poor, and that the charge that they are not is therefore untrue.

Dr. W. W. WALKER, New York. What have we learned from the papers and discussions to which we have just listened? That some members of the profession think we have too many dental colleges; while others think we have not. Personally, the speaker believes that there is room for many more, if we only raise the standard high enough. He moved that the discussion on these papers be closed.

So ordered.

Dr. S. H. GUILFORD, Philadelphia, read the report of the special committee on Nomenclature appointed at the last meeting.

In introducing the report, Dr. Guilford said that he hesitated somewhat to bring the matter of the paper before so cultivated a body, but it is a fact that we are misusing and mispronouncing many terms. As instances, he mentioned the frequent use of "aluminium" for "aluminum;" the apparently interchangeable use of "absorption" and "resorption;" a glance through the journals shows that many writers have misunderstood the term "alveolus." It means a socket, yet it is frequently used for the entire alveolar process. The report is as follows:

Your committee, in endeavoring to carry forward the work it was appointed to perform, found it beset with some difficulties. Unfortunately, all of its members are busy men more or less, constantly engaged in literary work of some kind, who found it difficult to devote the necessary time to it. In consequence of this, or from other causes, only seven of the nine appointees took any active part in the labor, but those who did, labored faithfully and laboriously, as the report will testify.

The second and greater difficulty encountered was that the proposed work was rather new in character, and your committee had very little that would serve as a guide. The very admirable report on nomenclature prepared by Dr. Black, and read before the Columbian Dental Congress, has been carefully considered by your committee, and furnished it with materials of considerable value; but as it dealt principally with the anatomy of the teeth and cavities, we have found it necessary to broaden the scope of our work, and include, so far as we could, the terminology of the various parts of our specialty.

The nomenclature of any science or art, like a language, is not a creation but a growth. It starts with a small beginning, and is developed gradually. At first the terms needed to express the necessary things and ideas are few, because the latter are themselves limited, but with the growth and expansion of the science new terms are needed to describe the ever-developing facts, functions, and ideas.

Frequently the growth of a science or art is so rapid that the terms selected to convey the necessary ideas are chosen without a proper regard to their fitness. Such has been the case with many sciences, and such has, unfortunately, been the case with our own. More than this, those engaged in a pursuit that afterward develops into a science or an art are frequently men of limited education, who probably are not fitted, even if they were inclined, to select or frame the most suitable and correct terms for the purpose. Owing to these causes each science, in its infancy, has introduced into it words and phrases which, while they temporarily answer the purpose, are not really apt, and not etymologically correct. With the development of the science, and the coincident attraction to its ranks of those more liberally educated, the incorrect or inefficient terms are gradually eliminated, and their places supplied by better ones. This process is a slow one, for words, like tools, even though lacking the highest efficiency, become endeared to the average man through long association. For this reason it would be impossible, even if we were so inclined, to make any sweeping change in our terminology. As in our civil life it is found difficult to enact a law much at variance with previous custom, or, if enacted, to enforce it, so in professional or scientific matters any proposed radical change would meet with sufficient opposition to defeat it.

We must move slowly and carefully, and advance only as rapidly as we succeed in convincing our fellows of the advisability of the change. Terms that are scientifically incorrect should be discarded at once and correct ones substituted ; those that are not absolutely incorrect may be tolerated for a while longer ; but for the new ones which must necessarily be introduced from time to time, this association should establish a standard or code and use its great influence in securing its approval and adoption by the profession in this country at least.

While the establishment of a system of nomenclature of international character would be most desirable, the present does not appear to be the time in which to attempt it ; but if we can devise and adopt a system for our own country that has a scientific basis and is well adapted to our wants, we believe that it will eventually be adopted in whole or in part by other nations. The framing of a code is a task of considerable difficulty, for no one language contains all of the elements from which to construct a perfectly correct and convenient nomenclature. A living language will not do, because it is constantly changing. The choice, therefore, would seem to lie between one of the two dead languages, Latin or Greek. Latin possesses the advantages of large scope, of being more easily read and understood than Greek, and of furnishing the roots upon which a large proportion of the English derivatives have been constructed. Its chief objection is that its pronunciation has undergone great change in the past quarter of a century, and we are not certain that it will be free from future changes.

Greek, on the other hand, has suffered no change in our generation, either in form or pronunciation ; and while it is less easily read and translated by those whose classical education has been limited, it is probably richer in etymological possibilities than Latin. These advantages of the latter language seem to have been recognized and appreciated by the collateral sciences, for nearly all of the new terms introduced in them of recent years are of Greek origin.

In the science of electricity, and indeed physics in general ; in geology and mineralogy ; in theology ; in medicine and surgery—especially in the departments of bacteriology and pathology—almost the entire list of recent terms is constructed from Greek roots. If, therefore, these sister-sciences have deemed it best and most satisfactory to base their newer terminology upon a Greek foundation, can we do better than follow their example and keep in scientific accord?

In case we decide to accept the Greek language as a basis for our terminology, however, it does not follow that we must adhere to it rigidly in all cases, for in many instances, no doubt, the Latin, English, or other languages will furnish us with terms that are equally as good and probably simpler in form than corresponding ones derived from the Greek.

Whichever language is taken as a basis, it will be necessary to select root words, as far as possible, in each department or section of our nomenclature, and from these, by the addition of prefixes or suffixes, or by combination, to form a group of words having the same basis. Thus in our present nomenclature, taking the Latin word "cementum" as a base, we have constructed the words "pericementum," "pericementitis," "hypercementitis," each one expressing a different idea, yet all relating to a certain tissue or its immediate associations.

In the naming of tissues or parts or surfaces of teeth this method should be adhered to because it is scientific and systematic, but where a part to be named is not complicated by its surroundings, we may use more freedom in the selection of terms. In like manner, where a term has proven satisfactory, and has become well established through long usage, as the word "root," or where others equally satisfactory have been appropriated from some collateral science, as "quartz," "feldspar," and "kaolin" (the first being of unknown, the second of German, and the last of Chinese origin), it will be well to retain them regardless of their etymological variation.

Very many of our present terms have a Latin derivation, having been borrowed from our sister-profession, medicine; and where these have proven satisfactory and are not etymologically incorrect, we may allow them to remain. Many also have their foundation in Greek, as "gypsum," "asbestos," "prosthesis," "technics," etc.; while a few, like "celluloid," "centimeter," etc., are half Latin and half Greek. In the descriptive anatomy of the teeth, your committee is well pleased with the plan and terms proposed by Dr. Black two years ago, but some modification of that plan will probably be necessary.

Inasmuch as the terms used by common consent to indicate four of the surfaces of the crown of the tooth end in the Latin adjective termination "al," your committee favors the adoption of a word having the same ending for the fifth or antagonizing surface. Whether this shall be "occlusal" for the bicuspids and molars and "incisal" for the incisors, as suggested by Dr. Black; or "morsal" for all, as proposed by Dr. Kirk, remains to be determined. Your committee believes that the use of the single term "occlusal" for this surface of all of the teeth will serve our purpose best. As between the words "gingival" and "cervical" we recommend the adoption of the latter, because it is exact in its meaning and has the sanction of long use.

In naming the teeth themselves we strongly condemn the use of such unscientific terms as "sixth-year molar," "twelfth-year molar," and "wisdom-tooth," and urge instead designating them first, second, and third molars, respectively.

We also believe it to be more harmonious and appropriate to use the word "cuspid" instead of "canine" to indicate the single-cusped teeth, just as the term "bicuspid" is applied to their adjoining neighbors. So, also, in indicating a particular tooth, it is more methodical and correct to proceed from the general to the particular, naming first the jaw, then the side, and lastly the tooth, as: "superior, left, second molar."

The elision of the final vowel in such words as dentin, iodin, etc., as approved by such authorities as the Century and Standard dictionaries, your committee heartily concurs in and recommends.

This report would be extended to too great a length if it were to specify the many terms whose ill use has beclouded our terminology; but so far as we have been able to go, the results of our investigations will be found in the tabulated form accompanying this report, and which we trust will be easily understood.* In it we give, beside the word itself, its orthography, the pronunciation, part of speech, and the decision of several authorities as to its proper use. When a word has two forms of orthography, the preferred one is indicated, and so also the different shades of meaning of synonymous words is noted in the column for remarks. The authorities selected are the Century and Standard dictionaries, and Dunglison's, Gould's, and Thomas's medical dictionaries.

Your committee would beg to remind the association that this report marks but the beginning of its labors, and that much time and effort will be required to obtain anything like a complete or satisfactory result. If what we have thus far done should receive from the profession the careful consideration that the importance of the subject demands, and if enough interest is elicited to cause the subject to be brought before the various local and state societies during the coming year for intelligent discussion, criticism, and suggestion, your committee will be greatly aided in its future work.

The report was signed by the following members of the committee: S. H. Guilford, Louis Ottofy, E. C. Kirk, A. H. Thompson, Grant Molyneaux, T. E. Weeks, and C. L. Goddard.

Dr. GRANT MOLYNEAUX, Cincinnati, O., read the following report:

The report that I have is supplemental to Dr. Guilford's report, and is in the same line, but pertaining to prosthesis.

The department of prosthesis differs in its nomenclature from the other departments of dentistry in the fact that it contains a great many common words to which we have given a distinctive meaning, and to which the definitions, as found in the dictionaries, would not be applicable.

For example, the words "cast" and "model" are often used by dentists as synonyms. The former is found in one dictionary only. "Model" is not recognized in any of the dictionaries to which I have had access.

The accepted meaning of "model" is, "a mechanical imitation or copy of an object; something to be patterned after; anything of a particular form or shape to be imitated."

The word "cast" is given a special meaning in only one dictionary. In all others it is given the general meaning, as, "anything formed in a mold; a mass of plastic material which has taken the shape or form of some cavity."

Many dentists use these words interchangeably, while others give them a distinctive meaning, as follows:

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* The tabular statement referred to will be printed in a future number of the DENTAL COSMOS.—ED.

A "plaster cast" is a fac-simile of a mouth, in plaster of Paris, upon which a denture of celluloid or vulcanite base is to be molded; a plaster cast for vulcanite; a tin cast for molding celluloid; a marble-dust-and-plaster cast for Watts metal.

When the plaster cast is to be used for making a mold for dental dies, to be used for swaged work, it is then called a "model," because it is then to be imitated in metal, and then only is it to be called a "model."

This certainly seems to be a very excellent method, for, by using these terms with a distinctive meaning, description is abbreviated by doing away with explanatory sentences. When we refer to a "cast," we know exactly what it is. When we refer to a "model," we mean that it is to be imitated in metal.

"Vulcanite" and "rubber" are often used as synonyms, the former certainly being the proper term. Caoutchouc or rubber is a definite hydro-carbon. When this substance is combined with sulfur and other ingredients and is vulcanized, or hardened, by subjecting it to a definite temperature for a definite time, it forms a different compound, which in no manner resembles rubber, but is an ivory-like substance which we term vulcanite.

"Velum" and "obturator" are used by many interchangeably. It seems to the committee, however, that such terms can be given a distinctive meaning, even if the function of these appliances be one and the same. By applying "obturator" to vulcanite appliances used in the treatment of cleft palate, and "velum" to flexible vulcanite, the terms seem to be sufficiently suggestive to be retained.

In the metallurgical department we have many terms used improperly, such as "white metal," "platinized silver," "platinized gold." It is not infrequent to hear the term "platinized gold" used when referring to gold alloyed with platinum, often called "clasp metal" and "spring metal."

The most modern information on this subject says, "A metal *covered* by platinum is platinized; preferably by electrolysis."

I will refer to the definitions of the Century and Standard dictionaries: "Platinize; to coat with platinum in a fine state of division; platinized, by dipping in a solution of platinum chloride and then heating in a closed chamber until the metal decomposes."

According to the Standard: "Platinize; to coat with platinum, preferably by electrolysis."

In order to get an idea of this matter from a goldsmith, I sent for a piece of platinized gold of definite gauge, and received a piece of metal, one side being gold and the other platinum, equal weights of the two metals, welded so as to be inseparable.

We have the same combination in the supply-houses, known as "platinized gold" or "crown gold," "platinum" and "gold crown-metal."

The best authorities say "platinous" is the proper word, as "platinous silver," silver *containing* a small percentage of platinum; "platinous gold," gold *containing* a small percentage of platinum.

It also seems that "platinous silver" is to be preferred to the term "white metal," as the latter term is vague and inexpressive, for there are many combinations of nickel known as "white metal."

By adhering to the use of "platinous alloy," "platinous silver," "platinous gold," we have a term that means exactly what it says. It is strictly in line with chemical nomenclature, and is susceptible of improvement. We have now one combination of platinum and gold which we know as "clasp metal." We call it "platinous gold." If for any reason the proportion of platinum in an alloy needs to be increased, we can then have a platinic alloy. If we need to have more compounds, the word is susceptible of improvement by the prefixes "hyper" and "hypo," so that we can always designate the compound by a definite term. While it does not seem that these improvements are necessary, the word "platinous" is the proper one, according to all authorities, and should be adopted when referring to clasp metal or spring gold containing a small amount of platinum, instead of the term "platinized gold."

There is at the present time a good deal of discussion as to the words "aluminum" and "aluminium." A rule has obtained for fifty years or more which designates the rarer metals by an extra "i," such as "palladium," "osmium," "rubidium." When the metal comes into common use, the extra "i" is dropped, as in the case of aluminum. This would seem to be an excellent rule to follow, because it distinguishes the rare metal from the metal in common use.

Dr. Black has suggested substituting the name "occluding frame" for the word "articulator," in order to be in harmony with the nomenclature of the dental anatomy. Your committee suggest the continuation of the term "articulator:" First, because of its long usage; second, because it is a single word; third, because it is a word which is more suggestive of the operation to be performed, and we cannot see that it will in any manner interfere with the nomenclature of the dental anatomy.

"Autogenous soldering" is a term often applied to the process which we know as "sweating." The best authorities tell us that it is used erroneously in this sense. It is not quite decided what word would be best, "welding," "sweating," or whether to adopt the term "autogenous soldering." It is still under consideration.

The words "prosthesis" and "prothesis" are used as synonyms. The meaning of the prefixes being slightly different in the original language, "pro" meaning "to put before or to stand before;" "pros" meaning "to place, or to put to place or position," the committee has adopted the word "prosthesis" as being the proper term to use.

Dr. A. H. THOMPSON, Topeka, Kan., also a member of the committee, read a paper entitled "A Basis for Dental Nomenclature," as follows:

That dental nomenclature is in a barbarous condition is admitted on all hands. What little system we have is crude and chaotic, and our terms are clumsy and unwieldy in practice and mostly unscientific in origin and development. Like all systems of terminology, ours is more or less arbitrary and artificial, and has grown by the accretion of accidental terms, coined and applied without reason and often without appropriateness or discrimination.

It is true, of course, that names must often be applied without reference to meaning or relationship to the thing named. Words that are self-explanatory and descriptive cannot always be found, especially when things that are entirely new to science are to be named. Names for new things must be root-words, from which whole series of related terms, descriptive of properties or functions or relationships, etc., can be elaborated. This is illustrated by the recent nomenclature of electric science, in which new things have been discovered or invented which required new and distinctive names, and those names are root-words from which secondary terms are derived.

In dental nomenclature many names have come down to us, some of which are awkward and insufficient, but must now be accepted because established by usage, and it would be impossible to change them. Others well express meanings and descriptions, and lend themselves to the uses of root-words for the derivation of explanatory terms. The primitive names applied to the teeth and their gross parts must now be accepted, but it is not too late to control and render scientifically correct the new and derived words for minute regional anatomy, functional characteristics, etc. While many early names are merely arbitrary, others are quite descriptive, and all must be accepted and the best use made of them that may be possible, in order to avoid confusion by attempting too much change.

It is generally conceded that our nomenclature is greatly in need of correction and codification, and to that end the first thing to be considered is a starting-point. To all students of the subject it would seem that this is furnished all ready to our hand by Dr. G. V. Black, in his admirable study and *résumé* of the subject given before the World's Columbian Dental Congress and published in the Transactions (vol. ii, p. 825). He has there given the history and philosophy of the subject in a manner that is complete and exhaustive, and that will render any other work in that line superfluous. This great paper is a landmark in the history of dental nomenclature, and may well serve as the starting-point for a new departure. Without wasting time in the discussion of the desirability of having an established nomenclature, on which we are all agreed, we might as well proceed at once to formulate a code arbitrarily.

This can best be done by the American Dental Association, which is the national representative body of the profession in this country, the exponent of the opinion and policy of the profession, and as having authority in deciding questions of general interest to the profession. A decision emanating from this body would be held in respect by the profession, and the code of terms of nomenclature would be final and would gradually come into acceptance and use. A start must be made, and it must be arbitrary, and this body is the only proper organization to take hold of the matter.

A list of the terms in general use should be submitted this year, to be known as "The Code of 1895," and lie over for one year to allow time for discussion and criticism by the profession at large, and then be adopted, with whatever corrections and amendments may seem desirable, at the ensuing annual meeting. Lists of terms in all departments can be added to this code from year to year, as may seem desirable, by being proposed and submitted, laid over for one year for criticism and discussion, and then adopted. Newer terms in regard to some disputed points will provoke discussion, but they must be decided, and decided finally. A year's discussion will probably result in satisfactory terms for the points in dispute.

The writer is disposed to think that terms can be borrowed from the naturalists in naming the parts of teeth, that will dispense with many cumbrous combinations now in use in our literature. Some are offered in the list, and others will be included in the list of names for comparative dental anatomy.

A systematic dental nomenclature should be founded on the zoological system of names of the teeth of mammals employed by naturalists as a basis ; on this should be placed a professional nomenclature, like Dr. Black's, for the use of dentists ; and on this a still more minute mapping system for the localizing of cavities, something like that prepared by Dr. Kulp. The three systems are indispensable. First, the gross descriptions of teeth ; second, the detailed descriptions ; and third, the minute localization of areas on the surfaces of the teeth. Some arbitrary system of localizing cavities, like Dr. Kulp's, is desirable, to avoid the cumbrous combinations of compound words which would otherwise be necessary. Dr. Kulp's plan of mapping the crown is the best of the kind, perhaps, yet offered. This is a matter that must be considered wisely before the final adoption of any system of minute description, such as is required in locating cavities.

But the matter is merely to be inaugurated at this meeting, and the list submitted. Then the work must be continued from year to year, proceeding slowly, in order to give ample time for discussion and suggestion. The committee invites suggestion and correspondence, to the end of obtaining a complete list, and that the code adopted may be harmonious and satisfactory to the profession.

Dr. G. V. Black, Jacksonville, Ill., being called for, said that he would have preferred not to open the subject, but rather to have heard others first. The importance of the subject treated of in these papers merits our closest attention and study. He should not attempt to particularize as to individual words, but rather to discuss the general subject. In order that we may adopt and use words correctly, great care must be exercised in selecting. While the selection of words as names for things and the formulation of rules for their use are of great importance, a movement to that end will not succeed unless there is a careful, judicious effort to harmonize the practice of different sections in the use of them. In medicine, in general practice, there is no accepted nomenclature, though some of the specialties have. If we are to have a generally recognized nomenclature in dentistry, we must arrange ourselves in groups for the systematic study and use of the best forms. Then the work accomplished should be taken up by the Faculties Association, and the use of the terms definitely settled upon should be enforced in the schools, and the recognition of a college should be made dependent upon its teaching its students so. This seems like a harsh rule, but it is not nearly so harsh as measures which have been enforced in other lines. It is not necessary to wait until the entire scheme of nomenclature is completed before any part of it is put into operation, for nomenclature is a living science, constantly growing, and never complete.

The speaker's advice would be to organize for study of the subject, formulate words and rules so far as we can, and then enforce the teaching of so much as has been determined, in the schools. Then by keeping up the work of study and adoption as fast as definite conclusions shall have been reached, we shall have in a few years a nomenclature of which we may be proud.

No vocation can succeed without its technical terms. The plasterer has his technical words for different processes, which are adhered to as rigidly as are the terms used in botany. We must have our technical terms, and we must adhere to them, and thus we shall lessen the student's time in the study necessary to accomplish his work. This association cannot alone establish a nomenclature for dentistry: it is the starting-point, the center of control, but to make the work effective we must be organized throughout all the ramifications of professional work, and we must follow it up unceasingly,—must never stop. The report of the committee says we must attend to the nomenclature of dentistry for this country; but we cannot confine it to the English language. What is done here must be done for the German and the French as well. The work which is proposed to be done here affects the language of the world, and we must look to the roots in French and German. Thus the word "abrasion" in French means the removing of calculus. All such things must be looked into. Even in the German, which clings most tenaciously to its own words, they use English terms to describe the various surfaces of the teeth. So we want to follow the root-words carefully in their basal significations. The word "*mordeo*," from which comes the proposed term "morsal," is represented in German by a word which means to murder, to bite, to kill. So in other languages root-words are used for different meanings than those which we apply to them.

The best way for us, as has been done in other sciences, is to find some one with sufficient capacity, qualifications, and the taste for the work, with a knowledge of the various languages, to take it up and be the leader. It requires not only one who has the necessary educational qualifications, but one also who has the inclination to work continuously.

Dr. T. C. STELLWAGEN, Philadelphia, mentioned the plan which he had adopted to familiarize the students of the Philadelphia Dental College with the nomenclature of physiology more especially,—a small book in which are written the terms used, with their meanings. They are thus taught to use the words exactly as they are intended to be used, and so keep their edges keen. Only two hundred to three hundred words suffice for the ordinary uses of life among the uneducated. In preparing the plan previously spoken of he had made a study to see how many terms were used in physiology, and he found something less than two hundred roots. With these a scaffolding was erected upon which many more terms could be hung, and so the work was begun. The plan worked so well that now the little book is printed, and interleaved to afford space to note new combinations as needed.

In reply to a question, Dr. BLACK stated the correct pronunciation of "nomenclature" to be no′-men-cla′ture, with the accents upon the first syllables of the two original words.

Dr. THOS. E. WEEKS, Minneapolis, said that the question just replied to emphasized the fact that in our pronunciation of terms, as well as in their proper use, there is still room for improvement. If the movement that has been set on foot is carefully and persistently followed out, great good will result. He hoped the committee would be continued, and that the association may adopt the work of an honest and earnest committee. Every gentleman with experience in teaching dental students knows the difficulties to be contended with when there are no definite terms to describe objects and operations. We must agree upon our terms in some way, and then stick to them.

Dr. W. C. Barrett, Buffalo, approved the report of the committee and the work it had done, and he wished to call attention to certain solecisms and barbarisms which are very offensive, as "wisdom-tooth" for the third permanent molar, and "fangs" for roots of teeth. There is where, in his opinion, the work of reforming the nomenclature of dentistry should begin; these exceedingly gross violations of propriety and accuracy should first engage our attention.

Dr. A. H. Thompson. This matter of expunging objectionable and meaningless terms is a work of which the committee recognizes the importance, and they will do it as fast as they can; but they cannot do it all at once. Instances might be multiplied, almost without limit, of variations in the use or pronunciation of words. Thus, of "alloy," two pronunciations are in use; of "cement," the same. We must have a distinct basis of understanding of all these matters, and the committee hoped in time to have all the errors corrected.

Dr. John S. Marshall, Chicago, moved that the report be accepted and the committee continued, and that the list of words upon which they agree be submitted to the association for criticism and suggestion before final action is taken upon them. So ordered.

Dr. Guilford. Steele compared words to tools. It was an excellent comparison. Words are tools. Driving nails with a hammer, with a monkey-wrench, and with a rude piece of iron, this is analogous to what the dental profession has been doing in its use of words. This report was made to show what the committee had done. Every dental society ought to take up the work, and every man ought to constitute himself a committee of one to look the matter up for himself, and then next year we shall be prepared to act. Then, if the teachers in the colleges and the editors of the journals will use the terms agreed upon, a desirable change will soon be brought about.

Dr. Guilford then moved that Dr. Black be placed upon the committee in place of Dr. Stubblefield, who had been unable to act with it.

On motion of Dr. A. H. Thompson, the subject was passed.

(To be continued.)

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## SOUTH CAROLINA STATE DENTAL ASSOCIATION.

The twenty-fifth annual session of the South Carolina State Dental Association was held in Spartanburg, July 1 to 3, 1895; President Oeland in the chair. The attendance was good, and a number of new members were received.

Clinics were given in Dr. J. T. Calvert's office.

A reception at Converse College was tendered by the citizens.

The following officers were elected for the ensuing year: B. Rutledge, Florence, president; E. G. Quattlebaum, Columbia, vice-president; R. Atmar Smith, Charleston, recording secretary; J. William Boozer, Columbia, corresponding secretary; G. W. Dick, Sumter, treasurer.

Columbia was selected as the next place of meeting; the time to be arranged by the Executive Committee. Meeting of State Board of Examiners at same time and place.

The following constitute the State Board of Examiners: G. F. S. Wright, D.D.S., Georgetown; J. R. Thompson, Newberry; L. P. Dotterer, Charleston; A. C. Strickland, Anderson; G. W. Dick, Sumter.

Licenses were granted to W. J. King, Anderson; J. L. Reaves, Orangeburg; S. M. Gunter, Wagner; S. F. Killingsworth, Abbeville; T. J. Crimes, Greenwood; J. F. Geiger, Manning; C. C. Stanley, Brookland; H. K. Smith, Union; J. A. Goldsmith, Charleston.

J. William Boozer, *Cor. Sec.*,
1515 Main st., Columbia, S. C.

## NEW BRUNSWICK DENTAL SOCIETY.

At the annual meeting of the New Brunswick Dental Society, held in Sussex, N. B., in August last, the following officers were elected: G. J. Sproule, D.D.S, Chatham, president; H. C. Wetmore, D.D.S., St. John, vice-president; W. P. Bonnell, D.D.S., St. John, secretary.

The Board of Examiners elected were: J. M. Magee, D.D.S., H. C. Wetmore, D.D.S., and E. Manning.

The Council of Dental Surgeons held its meeting at the same place, and elected A. F. McAvenny, D.D.S., president, and Frank A. Godson, D.D.S., registrar.

The next annual meeting of the society will be held in St. John, N. B., on the second Tuesday in August, 1896.

## DENTAL ASSOCIATION OF NEW SOUTH WALES.

The third annual meeting was held at the Australia Hotel, Sydney, on Friday, August 2, 1895, and was well attended. The president, Dr. Burne, occupied the chair, and stated, on behalf of the council, that great hopes were entertained of the dental bill being brought before parliament and becoming law during the ensuing year. The balance-sheet showed a credit balance of £73 in hand. It met with general approval. The following officers were elected for the year 1895–96: Dr. Burne, president; Messrs. H. Paterson and S. Chaim, vice-presidents; Dr. W. T. Halstead, hon. treasurer; Mr. H. Taylor, hon. secretary; Dr. Arthur Hinder, Messrs C. C. Marshall, F. G. Hollway, J. Darton, H. S. Newton, E. A. Gabriel, and Byron Ruse, committee; Messrs. Corbett and Hebblewhite, auditors. A vote of thanks was unanimously accorded to the president, who, in thanking the members for their support, referred to the necessity of the profession drawing closer together, and thus securing a higher status. A vote of thanks to the hon. secretary for past services, and also to the chairman, closed the meeting.

H. Taylor, *Hon. Secretary.*

# DENTAL SOCIETY ANNOUNCEMENTS.

## UNION MEETING OF THE SIXTH, SEVENTH, AND EIGHTH DISTRICT DENTAL SOCIETIES OF THE STATE OF NEW YORK.

A UNION meeting of these societies will be held in Binghamton, N. Y., October 29, 30, and 31, 1895. These meetings have during late years developed in importance until they have become among the most interesting dental meetings held in the state of New York. An attractive program has been prepared, and all indications point to a successful and profitable meeting at Binghamton. A cordial invitation is hereby given to all reputable practitioners to attend and contribute to the general interest of the occasion.

GEORGE H. SMITH, D.D.S.,  
*Chairman Joint Business Committee,*  
Cortland, N. Y.

## UNION MEETING OF THE CONNECTICUT VALLEY AND NEW ENGLAND DENTAL SOCIETIES.

A UNION meeting of the Connecticut Valley Dental Society and the New England Dental Society will be held at Worcester, Mass., October 23, 24, and 25, 1895. Many interesting papers and clinics are promised, and an elaborate program is assured.

An important question, "Shall these two Societies consolidate, forming a new Society to be called the 'Northeastern Dental Association'?" will be decided at this meeting.

GEO. A. MAXFIELD, D.D.S., *Secretary C. V. D. S.*  
E. O. KINSMAN, D.D.S., *Secretary N. E. D. S.*

## AMERICAN DENTAL SOCIETY OF EUROPE.

THE meeting of the American Dental Society of Europe held at Boulogne-sur-Mer, France, under the presidency of Dr. Chas. W. Jenkins, of Zurich, was one of the most successful and interesting meetings for several years.

The next session will be held in Dresden, Germany, in 1896, immediately preceding the meeting of the International Medical Congress in Moscow, thus allowing of attendance upon the two sessions without loss of time.

The officers elect for the coming year are as follows: John H. Spaulding, Paris, president; Chas. J. Monk, Wiesbaden, vice-president; Wm. A. Spring, Dresden, secretary; Samuel S. Macfarlane, Frankfurt, treasurer.

## NORTHERN ILLINOIS DENTAL SOCIETY.

THE tenth annual meeting of the Northern Illinois Dental Society will be held in Rockford, Ill., Wednesday and Thursday, October 16 and 17, 1895. A good program is in course of preparation, and all dentists are welcome.

JAMES W. CORMANY, *Sec.*,  
Mt. Carroll, Ill.

## CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

The opening fall meeting of the Central Dental Association of Northern New Jersey will convene at Davis Parlors, Newark, on Monday evening, October 21, 1895. A paper will be read by Wm. J. Evans, F A.I., of New York, entitled "Electrical Diffusion." The usual banquet at 6.30 will precede the meeting.

Charles A. Meeker, D.D.S.,
*Chairman Committee.*

## ALUMNI ASSOCIATION OF THE CHICAGO COLLEGE OF DENTAL SURGERY.

The great success of the clinic conducted by the Alumni Association of the Chicago College of Dental Surgery at its last January meeting has determined the association to repeat the program, considerably extended, at its coming January meeting; making a two-days' session, instead of one, and enlarging upon the social features so highly appreciated last winter.

The spacious rooms and up-to-date equipments make the college an ideal place for clinics of all kinds, and permit of making them instructive and satisfactory, not to a few only but to all in attendance. Many of the best clinicians in the country will participate, and the meeting will no doubt be largely attended. Extended notice will be given later.

R. B. Tuller, D.D.S.

# EDITORIAL.

## SIR JOHN TOMES.

As announced in our last issue, the death of Sir John Tomes, F.R.S., F.R.C.S., L.D.S. Eng., occurred at his home in Caterham Valley, Surrey, England, on July 29. The passing away of one who has been for so many years an active agent in shaping the development of dentistry as a profession is an event of special significance, and a due recognition of the professional relationships of such a career, one almost unique in its beneficence to dentistry, becomes nothing less than an obligation.

A public benefactor belongs exclusively to no country, but to the world. In the death of Sir John Tomes, not alone the dental profession of England, but that of the whole world, has sustained a loss that it is not easy to estimate.

A man of varied and high attainments, his influence in the building up of dentistry toward the high plane of a learned profession has made a strong impress.

It is given to but few men to shine brilliantly in several lines; but whether viewed as a practitioner, a scientific investigator, a dental legislator, or as the exponent of a higher and more liberal educational standard in dentistry, Sir John Tomes was a leader.

As a scientific investigator his writings embody the best that has been said upon the subjects within their scope. They bear the stamp of the truth-seeking scientist, in which enthusiasm in his work and love for nature's truths dominate all personal considerations. He was wedded to no pet theories upheld by observations made to suit the case, but was content to see and truthfully interpret what he observed of the phenomena of nature for the benefit and advancement of his colleagues. Had he confined his labors solely to the fields of research in dentistry, his profession would still have honored him ; but it was as a professional leader, with the keen insight to grasp a great principle in the elevation of professional standards, putting it into operation for the good of his fellows, "blazing the way for future generations" of dentists, that he will be most dearly remembered by those who reap the benefits of his life-work.

He early saw that if dentistry was to be lifted from the level of a mere trade or mechanic art, it must be by the education of its practitioners in the scientific principles fundamental to the art, as well as in the technique of its manipulative procedures. It was clearly a belief in this principle which led him over fifty years ago, in connection with other leading dentists of England, to memorialize the College of Surgeons "to recognize the claims of dentistry to be considered a department of general surgery." Although the attempt at that time (1843) failed, because of the lack of support from medical men and the absence of a public sentiment favorable to it, the interest and activity of Mr. Tomes continued unceasingly until the object was finally accomplished in 1859 by the institution, under a royal charter, of a Department of Dental Surgery at the College of Surgeons.

While this consummation marked a decided advance in the educational standard, giving to it a professional status before impossible, it was still purely optional in character ; any one, whatever his qualifications or otherwise, might practice dentistry in England without restraint. No permanent benefit, having general bearing upon the educational qualifications of the English dental profession, was directly attainable until the new standard was rendered compulsory by appropriate legislation.

With untiring energy and zeal Mr. Tomes labored to this end, and on July 22, 1878, the act regulating the practice of dentistry in Great Britain received the royal assent, and Sir John Tomes was the first to inscribe his name on the Dental Register.

During the time between the establishment of a dental department in the College of Surgeons and the passage by parliament of the

Dentists Act, which made the new dental educational standard compulsory, much inharmony of sentiment with respect to the character of the dental curriculum arose. To quote the words of Mr. Tomes in his address before the Dental Reform Committee, at its meeting in Edinburgh in 1877,—

> "Dental practice was approached from two distinct and very different points, and the difference of approach led to differences in professional character and feeling, which, up to the present time, have been a barrier to the attainment of that completeness of professional education which it should be the business of this generation to bring about. From the one side came the qualified surgeon, who had yet to gain technical skill, and this he trusted to acquire by the experience afforded by the treatment of patients, or from private instruction. At the hospitals nothing could be seen but mere rude tooth-drawing, so that his proficiency in the art which was to form the business of his life depended on unusual personal aptitude, or on great luck in the selection of a teacher. From the other side came practitioners who had entered upon special training as articled pupils in their youth, serving with established dentists from their school-days up to the age of twenty-one years. From five to seven years had been devoted to special training, but they had received no systematic surgical education. If they were real dentists, they were but amateur surgeons. Still, it cannot be denied that they more than held their own against those whose surgical education was complete before they thought of dental practice. . . . The dentist with surgical qualification regarded the dentist who had received only a special education as his inferior, and often declined to act with him on terms of equality; while the latter declared that the former was unskillful as a dentist, whatever he might be as a surgeon, and pointed to the numerical superiority of the technical dentists and to their more than equal success in practice, in proof of the assertion. This wretched state of antagonism and false pride was a sad hindrance to any unity of purpose in amending professional education. They were both dentists, after all, and the public cared little about diplomas so long as efficient assistance was forthcoming at the time of need. Both were imperfectly educated. The one wanted surgical and the other technical training. It required a fusion of the two to make a really competent practitioner. The one knew the grammar of dental surgery, but could not apply it; the other had learned how to practice, but knew not the surgical laws by which the practice should be governed. The two would not work together to draw the profession out of its educational difficulty."

To harmonize these discordant elements, and thus secure completeness and unity in the standard and methods of dental education, was the object for which Mr. Tomes labored. He made a careful study of the educational methods in vogue among the dental colleges of America; he recognized what points of superiority and advantage they possessed, frankly and generously according to America the credit due to it in first instituting colleges for the special training of dentists. If such a characteristic as British insularity exists at all, it formed no part of the attributes of Sir John Tomes. His was a spirit large enough to realize that no national or territorial limitations could be hedged about the world of scientific thought and educational progress.

In his paper before the International Medical Congress held at London in 1881, he said, speaking of the need for more complete education for the dentist,—

> "But we were not the first to recognize the necessity of a systematic dental education. Our American brothers had not only felt but provided for the need, in the organization of dental colleges; and we, in following in their footsteps, and profiting by their experience, accepted an obligation which should at all times be freely acknowledged."

The element of weakness which he saw in the dental educational system of this country was the insufficient education of the student in the medical branches which are fundamental to and should be an essential part of the educational equipment of each practitioner of all departments of the healing art. No one recognized more clearly than he the vital necessity for a just balance between the theoretical and surgical portion of the curriculum, and its practical and technical part. It is extremely important that this fact should not be lost sight of in estimating the value of his services to the cause of dental education.

The result of his endeavors was the establishment of a dental curriculum embodying essentially the principle which he so earnestly advocated. He believed that the function of dental education was to make dentists capable of intelligently practicing their vocation, and that the practice of dentistry was the one ultimate object to be kept in mind from the beginning and throughout the period of studentship. Hence his repeated emphasis of the necessity for a correct proportional relationship in the elements of the dental curriculum. His remarks before the Dental Reform Committee in 1877, from which we here quote, clearly set forth his views in this regard as follows:

> "To the student, . . . I would say at the outset, make up your mind whether you will be a surgeon, or a dentist, or a dental surgeon; and whichever you select, make yourself thorough master of it before you think of any other qualification. . . . I would not have it supposed that I underrate the value of extended professional education, but it must not be forgotten that long experience shows that the dentist with a surgical qualification does not practice general surgery, and the general surgeon does not practice dental surgery beyond the drawing of a tooth or opening of a gumboil. In fact, special and general practice cannot be conveniently associated, and consequently they are never really represented in one practitioner."

We have characterized him as a leader; he was more than that, he was a seer,—the evangel of a new order of things in dental education. When it is considered that over fifty years ago he enunciated the principles which have in largest degree determined the eventual development of modern dental educational methods, his prophetic character, his intellectual greatness, cannot be called in question.

It rarely happens when men have labored for the establishment of a great principle for the uplifting of their colleagues, that they live to see its fulfillment. While the principles which were the compelling motive in the life-work of Sir John Tomes are still the most active and vital issues in dentistry to-day, and are those which will continue to operate while we exist as a profession, he lived to see the dawning of the new era and the profession which he honored fully imbued with the truths which he had enunciated, a legacy fraught with power for the healing of the nations.

When one who has been so closely identified with a great work responds to the summons to lay it down, the sense of loss in those who have relied upon his leadership expresses itself in a feeling of anxiety as to the future of the cause for which he labored so well. But while the individual life-work of Sir John Tomes is completed, the activities which he helped to set in operation must ever progress, for

> " . . . the individual withers, and the world is more and more."

He lived to see the fulfillment of a phase, the establishment of an era in dentistry which the processes of evolution must continue, and the details of which others fitted to the occasion will work out. The increasing specialization of medicine on the one hand and the enlargement of the dental curriculum on the other are factors which, in the near future, can have but one result,—viz, that the branches which are fundamental to all departments of medicine, including dentistry, will be taught uniformly to the students of each specialty, and form the foundation of their special training, which latter will be acquired either subsequently or *pari passu* with their medical training. When such a uniform fundamental training is an assured fact, the anomalous position of dentistry with respect to the other branches of medical practice will be a thing of the past.

That such a result is greatly to be desired, ought not to be doubted ; that it is the logical consequence of the present tendency in our professional educational systems, cannot be disputed. When this ideal has been reached, and the history of the motive forces which led to its accomplishment is written, the unselfish devotion, the untiring energy, and consummate leadership of Sir John Tomes will be accorded a foremost place in the gratitude of those who win the guerdon.

The characteristics of this man as they found expression in the closer relations of social and private life, enticing and full of interest as the topic is, can be adequately treated only by those who knew him best. The editorial article in the *Journal of the British Dental Association* for August 15 sympathetically portrays some of the personal attributes which won for him the love and allegiance of those whom it was his life-work to serve. The same journal contains an elaborate sketch of Sir John Tomes, to which we are indebted for much of the data here presented, and we reciprocate on behalf of the dentists of America the sentiments of the closing paragraph of the editorial in question, as follows:

> "We who follow him have yet to realize his absence: for the present, we can but mourn the loss of a kind and generous-hearted benefactor. And in behalf of the whole body of dentists at home and in our other homes across the Atlantic and in the Southern Seas, we gather up our tribute of sorrow, and with loving veneration lay it on the grave of our departed friend, and to his loved ones left behind offer our deepest heartfelt sympathy."

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# OBITUARY.

## SIR JOHN TOMES.

DIED, July 29, 1895, at his home, Upwood Gorse, Caterham Valley, Surrey, England, Sir JOHN TOMES, F.R.S., F.R.C.S., L.D.S. Eng., in the eighty-first year of his age.

John Tomes was born on March 21, 1815, at Weston-on-Avon, Gloucestershire. He commenced the study of medicine under the tutelage of a practitioner at Evesham, to whom he was apprenticed in 1831. He entered the Medical Schools of King's College and Middlesex Hospitals. He was house surgeon at the latter for two years, and passed the first examination for the degree of M.B. at the University of London in 1839. He was dental surgeon to King's College Hospital for some years, and resigned that post for the same one at Middlesex Hospital. During his house surgeonship at Middlesex he invented forceps adapted to the necks of the different teeth, which caused Sir Thomas Watson to advise him to adopt dental surgery as his profession. In 1840 he commenced practice at 41 Mortimer st. (now Cavendish Place), London, and for some years, even after his marriage in 1844, he had a hard struggle to make both ends meet. In 1845 he invented a machine for copying in ivory irregular curved surfaces, which obtained the gold medal of the Society of Arts. In 1845 he also delivered the course of lectures at Middlesex which marked a new era in dentistry, and when published in the *Medical Gazette*, and afterward, in 1848, in book form, at once made his reputation as a scientific observer. In relation to these lectures there is this note in his diary: "I am resolved never to deliver any more lectures unless I have a class of six."

Following the announcement of the discovery of the anesthetic use of ether, in 1846, by Dr. Morton, of Boston, Mr. Tomes at once took it up, and successfully used it in his work at the hospital. In 1843 he joined a few leading dentists in memorializing the College of Surgeons to recognize the claims of dentistry to be considered a department of general surgery. The attempt at that time failed, from lack of support upon the part of the medical profession and from the absence of popular sentiment in its favor. The interest of Mr. Tomes was unabated, however, and he continued his labors and interest in the cause he had championed until his object was accomplished, in 1859, by the establishment of a department of Dental Surgery at the College of Surgeons.

On June 6, 1850, he received the Fellowship of the Royal Society, as being "distinguished for his acquaintance with the sciences of anatomy and physiology."

In 1859 he published his "System of Dental Surgery," a standard work so well and favorably known as to require no further comment here. In 1862 a strong feeling which had arisen that the services of Mr. Tomes merited some public token of the gratitude of the profession took definite form in the presentation to him, on July 16, of that year, of a handsome service of plate by several of his brother-practitioners, in acknowledgment of the many valuable services he had rendered to his profession.

As he had been actively interested in securing the recognition of dental surgery as a department of general surgery, by the establishment of a more thorough educational curriculum for dental students, so in like manner his interest and activities were enlisted in the movement toward making the new standard of education obligatory by appropriate legislation. With untiring zeal he labored with others to that end, and on July 22, 1878, the Dentists Act became law. Sir John Tomes was the first to inscribe his name upon the Dental Register.

On July 26, 1880, the profession presented Mr. Tomes with a portrait of himself, by Macartney. In 1883, the very high compliment of Honorary Fellowship in the College of Surgeons was conferred upon Mr. Tomes. The college having the right to confer its fellowship upon but two persons annually, Mr. Tomes and Professor Huxley were selected for the honor as representative men of science, worthy of special regard. In May of 1886 he received and accepted the offer of knighthood "for eminent services rendered his profession."

In 1893 it became known that the golden wedding anniversary of Sir John and Lady Tomes occurred upon February 15, of that year. The opportunity thus offered to the profession of once more showing its appreciation and regard was enthusiastically welcomed. A deputation went to Upwood Gorse, and Mr. Brunton presented to Lady Tomes a silver-gilt inkstand, on behalf of the wives of the members of the profession. Sir Edwin Saunders announced the foundation of a triennial "Sir John Tomes" prize, to be awarded by the College of Surgeons, in recognition of satisfactory scientific work by Licentiates in Dental Surgery, and Mr. Hutchinson read an appropriate address on illuminated vellum, signed by a large number of dentists.

In the summer of 1894 his health, which had not for years been robust, was impaired still further by what appeared to be indigestion. This increased greatly, and in May his illness assumed a more serious form; and gradually growing worse, in spite of the best medical care, he died July 29, and was buried at St. Mary's, Upper Caterham.

Sir John Tomes, during the course of his career, filled the highest positions within the gift of his colleagues, and in each of these he evinced qualities of leadership and capability which raised him to the highest place in their esteem. His love of fairness and right, and the judicial qualities of mind which were among his strongest attributes, were qualities which gained for him the respect and confidence even of those to whom he was at times opposed.

His numerous contributions to the science and art of dentistry stamp him as a scientific observer of the highest order of merit, and the sum total of his characteristics, as recorded in his valuable life-work, will ever maintain his splendid example as an ideal for future generations of his followers to emulate.

We are indebted to the *Journal of the British Dental Association* for the greater part of the data upon which the foregoing sketch is based.

## DR. J. LEHMAN EISENBREY.

Died, August 20, 1895, at his residence near Chestnut Hill, Philadelphia, Pa., J. Lehman Eisenbrey, D.D.S., aged fifty-three years.

Dr. Eisenbrey was born in Bucks county, in 1842, and was a descendant of one of the oldest Pennsylvania families. When twenty-two years of age he studied dentistry, and for a number of years was clinical instructor in the Philadelphia Dental College. When the civil war broke out he enlisted in the Eighth Pennsylvania Cavalry, and served throughout the rebellion under General Sheridan. He was the despatch-bearer of his regiment for a long time, and acted on different occasions as lieutenant for his company. Dr. Eisenbrey practiced dentistry in Philadelphia for thirty years, and was well known as one of the most expert and successful men in his profession. Many years ago he was a partner of Dr. James E. Garretson. Until a year and a half ago he enjoyed a large practice; so much so that nervous prostration ensued as a result of overwork, and he was compelled to temporarily discontinue active work. To obtain relief a change of climate was sought, and a prolonged period was spent by him in Florida. This was unavailing, however, and he returned to this city last April, much weaker than when he first went away. His health gradually grew worse, and symptoms of melancholia supervened, although it was not supposed that his mind was seriously affected. That it was, however, became a certainty when, on the morning of August 20, it was found that he had taken his own life by shooting himself through the body with his rifle, the ball passing through the heart.

Dr. Eisenbrey was a conscientious and able practitioner. It was the good fortune of the writer to have been associated for over two years with him in the practice of dentistry, and during that time very many opportunities arose in which his manifest skillfulness and thoroughness as an operator were the subjects of admiring comment. It was not alone his executive ability as an operator, but his resourceful quality as well, which commanded admiration. He possessed unusual ingenuity in meeting the difficulties presented by complicated cases in practice. His attitude toward his patients, and his gentle but firm sympathetic treatment of them, strongly attached him to his clientele.

In his business relations he was just and equitable always. His loss is deeply to be deplored, and will be keenly felt by all who were fortunate in having known him either socially or professionally, or more intimately as a friend.

He was one of the original members of St. Martin's-in-the-Fields Protestant Episcopal Church, of Chestnut Hill, and was an earnest and active worker in the church. He was a member of the Independent Order of Odd Fellows, of General George G. Meade Post, No. 1, G. A. R., and of the following dental organizations: Odontographic Society of Pennsylvania, Odontological Society of Pennsylvania, Philadelphia County Dental Society, and Pennsylvania State Dental Society. He leaves a widow, who was a Miss Bradley, a descendant of a prominent Chestnut Hill family, a son and a daughter surviving. EDWARD C. KIRK.

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## DR. THOMAS H. CHANDLER.

DIED, at his residence, 72 St. Stephen st., Boston, Mass., on Tuesday, August 27, 1895, THOMAS HENDERSON CHANDLER, A.M., LL.B., M.D., D.M.D., dean and professor of mechanical dentistry in the dental department of Harvard University, aged seventy-one years, one month, and twenty-three days.

Dr. Chandler was the eldest of a family of five brothers. Born in the old Chandler homestead at the North End, Boston, he brought himself by hard and untiring work to a prominent position among the literary and professional men of that city. His early education was obtained in the old Eliot School, from which he was graduated at the head of his class, with the Franklin medal. He next entered the Boston Latin School, under Master Dixwell, graduating four years later as Franklin medalist and class leader. Harvard's doors now stood open to him, and he entered, after passing the admission examination with honors. His college career was as successful as had been his previous scholastic efforts, and he obtained several prizes for excellence in his studies, and graduated as a Phi Beta Kappa man and president of the Hasty Pudding Club. Having decided to follow the profession of the law, he entered the Harvard Law School, graduating in the class of 1853.

His eyes now commencing to trouble him, he applied for the post of usher in the Boston Latin School, and obtained it through his high scholarship and testimonials to his capabilities given him by Edward Everett, president of Harvard College. In 1858 he began the study of dentistry, a science then almost in its infancy, and some years later studied medicine, retaining, however, dentistry as his specialty. On the organization of the Harvard Dental School in 1869, he was offered the post of adjunct professor of mechanical dentistry, and, on the resignation of Dr. N. C. Keep in 1872, he was appointed professor with the degree of D.M.D. *honoris causa*.

The death of Dr. Thomas B. Hitchcock in 1874 left the school without a dean, and Dr. Chandler was unanimously elected to fill the vacancy. During the twenty-one years he held this post, never until the few months preceding his death did he fail in attending a single meeting of the faculty or miss fulfilling a single duty connected with the office. The students all liked him, and his associates all respected him, for he was a man of the most unobtrusive and retiring disposition, which was often carried to the pitch of diffidence.

His literary work consisted chiefly of papers for the different medical and dental journals; an exhaustive article on "Thumb-sucking in Childhood and its Results" was translated into several European languages, and obtained a European reputation for its author. Translations of two works on dental caries, one by Leber and Rottenstein, and the other from the French of Magitot, were the chief events of his literary career. In this epoch of push and hurry it can be said of few persons that their work was done slowly, thoroughly, and to last. Dr. Chandler's ambition was not to be a shining light, but to use his best judgment, his utmost skill, and the greatest care in every task, however trivial, that he undertook. He was a good husband, a kind father, a true citizen, and an honest man.

## DR. EDWIN C. BAXTER.

Died, at Albany, N. Y., July 14, 1895, of typhoid fever, after an illness of eleven days, Edwin C. Baxter, D.D.S., in the fifty-first year of his age.

Dr. Baxter was born at Kenduskeag, Me., of New England ancestry, February 1, 1845. His father was Dr. Hiram C. Baxter, who practiced his profession for sixty years at the same place. His grandfather was Dr. Elihu Baxter, a prominent physician, who likewise practiced his profession for sixty years. His great-grandfather was born in Norwich, Conn., in 1749, and the family came from Norwich, England.

It was the desire of Dr. Baxter's father that he should also take up the practice of medicine as his profession, and he did commence the medical course; but dentistry being more congenial to him, and, as he often said, thinking two generations of physicians enough for any family, he abandoned medicine and began the study of his chosen profession with Dr. Edwin Parsons, a dentist of eminence in Portland, Me. From there he went to Philadelphia and began his studies in the Pennsylvania College of Dental Surgery, from which he graduated in 1866. He then, at the request of Dr. C. N. Peirce, professor of operative surgery in his alma mater, became his assistant. Afterward he went to New York City for a year, and returned, by suggestion of Dr. Peirce, to practice the profession with him, which he did under the firm name of Drs. Peirce & Baxter. Then, and about twenty-five years ago, taking the advice of Dr. Peirce, he went to Albany, secured the practice of the Drs. Nelson, and began practice in the city he was to make his home. He had a large and lucrative practice among the better people of the old Dutch city; had patients from all parts of the state, as well as from the New England states; devoted himself to operative dentistry, and became remarkably successful in his treatment of diseased teeth, and in crown- and bridge-work. He was frequently consulted by the leading physicians of Albany in regard to their patients, and was employed by them when they required the services of a dentist. He was examining censor and regent, had the respect and esteem of the leading dentists of the state, and was largely instrumental in securing the passage last winter of the law which places the dentists and their society under the State Board of Regents, and elevates the standard of attainments necessary for applicants to possess to secure admission to the profession. He was devoted to his professional work, and was a member of the New York State Dental Society, of the First and Third District Dental Societies of the State of New York, and of the Odontographic Society of Pennsylvania.

In 1872 Dr. Baxter married, at Brooklyn, N. Y., Lydia Ryerson Sprague, of the Long Island Sprague family, who survives him.

The doctor was refined in his tastes and feelings; sociable and agreeable in his manners; domestic, gentle, and lovable. Loyal in his friendships, he never seemed to have an enemy, and never spoke otherwise than charitably of any one. His life was full of the "gentil dedes" that Chaucer speaks of, and every one of his wide number of acquaintances sympathizes with his wife in a loss that seems untimely, and misses the kindly glance and warm hand-shake of a friend.

## DR. SAMUEL G. GUTELIUS.

DIED, at Millheim, Pa., July 30, 1895, of disease of the heart, Dr. SAMUEL G. GUTELIUS, in the sixty-first year of his age.

Dr. Gutelius was born in Mifflinburg, Pa., November 9, 1834. He commenced the study of dentistry with Dr. Wm. Harter, of Millheim, in 1865. After about three years of study he connected himself with his brother and fellow-student, Dr. C. H. Gutelius, in Aaronsburg, Pa. In 1872 he removed to Millheim, where he built up a practice which continued up to the time of his death.

As a dentist, Dr. Gutelius was a man of unusual skill and success, and fully abreast with the times. He usually attained the desired results, being always careful and thorough.

Dr. Gutelius was a veteran of the late civil war, in which he saw much active service in both infantry and cavalry, as second lieutenant of Company D, 150th Regiment P. V., "Bucktails," and as private in Company F, 12th Penna. Cavalry; the two services representing a period of three years, and in both instances receiving honorable discharge.

He was of a most jovial nature, yet modest; was a member of the Reformed Church for twenty-five years, in which he held the highest office for many years.

Dr. Gutelius was married September 23, 1869, to Miss Mary M. Erhard, who died four years ago. He leaves two sons and one daughter, Dr. Fred. E., Daniel B., and Lydia E.

## DR. DAVID K. HITCHCOCK.

DIED, at Newton, Mass., July 25, 1895, of diarrhea, Dr. DAVID K. HITCHCOCK, in the eighty-second year of his age.

Dr. Hitchcock was born at Brookfield, Mass., in 1813. At an early age he made Boston his home, and engaged in the printing business. This proving uncongenial, he entered the office of Dr. Thomas Barnes and pursued the study of dentistry, and, after graduating at the medical department of Harvard University, became one of the most prominent dentists of his time in Boston. He was a man of great energy, indomitable will, and genial and generous in disposition. An interesting incident of his professional career was the educating of two promising Armenians, one of whom became by special appointment dentist to the Sultan. This and other services rendered by Dr. Hitchcock were substantially recognized by the Turkish government.

Dr. Hitchcock served in the Massachusetts legislature; was connected with the Harvard College Library, and during many years was one of the directors and chief promoters of the American Peace Society. He was also instrumental in founding a free public library in Newton. He married Miss Abbey H. Barnes, and four sons and two daughters survive. He had been retired from active dental practice for several years.

## DR. AMASA F. CONWELL.

DIED, at Provincetown, Mass., July 6, 1895, of brain-affection, AMASA FRANCIS CONWELL, D.D.S., in the thirty-ninth year of his age.

Dr. Conwell was born at Provincetown, Mass., December 12, 1856. In 1886 he passed a dental pupilage with Dr. J. H. Webber, and also attended lectures at the Boston Dental College for about a year. He matriculated at the Philadelphia Dental College, and was a full graduate of that institution with the class of 1890.

After graduation, Dr. Conwell entered upon practice at his native place, Provincetown, and also soon opened an office at Orleans, Mass., dividing his attention between the two towns, and having at the time of his decease established a good practice. He was a member of the Massachusetts Dental Society.

In 1878 Dr. Conwell was married to Miss Hattie B. Rice, of Newton Lower Falls, Mass., by whom he had one son.

## DR. HENRI CRIGNIER.

WE regret to note the death of Dr. HENRI CRIGNIER, chief editor of the *Revue Odontologique*, and president of the association of L'Ecole Odontotechnique, Paris, France. He was in the forty-ninth year of his age, having been born at Paris in 1846.

Dr. Crignier was a skillful dentist, an able writer, and popular with an extensive clientele as well as among his literary confrères. His comparatively early decease is looked upon as the cutting short of a useful and brilliant career.

# PERISCOPE.

A CURIOUS CONTENTION.—A writer in a recent issue of a transatlantic dental journal, criticising a review published therein, concludes his letter with a very suggestive sentence. It is immaterial to our point to say more than that the matter in dispute is the correctness or otherwise of Heitzmann's description of microscopical observations; there are many doubters, and to these writes this reviewer of reviews: "Heitzmann's answer to doubt is the only correct one—come and see. Come to his laboratory and learn how to see. Any one who is unable to see the reticulum does not know how to see it. He that will not accept Heitzmann's drawings will not accept even the coming photographs, and probably he that will not accept these evidences is not willing to go to the expense of time and trouble to learn how to see for himself; certainly that individual expense should not be all saddled on Heitzmann or Bödecker, *et al.*" The concluding sentence of this quotation contains two distinct statements; the first is but a new version of the proverb, "None are so blind as those who will not see," and this, being an accepted postulate, we will dismiss; but the second is really an inverted form of the proposition that the observer or discoverer shall not be required to prove his case gratuitously. From this we are led to inquire, What does Science demand of its disciples? What help may one worker in the by-paths of science reasonably expect from another who may have preceded him? We feel we are not arguing a personal question; it is an abstract one with, perhaps, the personal application that we are engaged in the oft-needed task of defending distinguished authors from their friends. There are always two aspects to a scientific question,—the one commercial, the other abstract. It would be silly to deny the commercial side ; few of us, however fully imbued with professional instincts and feelings as regards matters of our own immediate sphere, would forego the reward of a discovery in other fields, say in chemistry ; but even here it is the commercial application of the fact rather than the fact itself which we would surround with that mystery which may be needed to prevent competition. Our better nature revels in a discovery for its own sake. It is a step nearer truth,—the truth of the great mysteries,—nature, life, death, disease. Money is a mere bagatelle compared to these ; to merely help toward this great end is reward enough. There can be no commercial aspect to questions like these, unless we would be classed with the soothsayer and the gypsy vagrant. Proof is the great end : to prove that which we say is true. Money may be needed,—our own if we have it, other peoples' if we have not,—money to conduct experiments, money to live on while we work or when we are too old to work, money to publish our work. If the expense of obtaining proofs of this or any other discovery is too great for individual effort, then by all manner of means let those who are interested lend a helping hand, not to prove it to Tom, Dick, or Harry, but to advanced workers in this field, whose opinion will carry conviction to those less able to form one of their own. A man is bound to prove his discovery or theory, to prove he speaks the truth, because impartial minds may help him to detect errors ; because he owes more to previous workers in the same field, who have provided him with the means of work, and the groundwork on which to build, than the work of a single life can possibly repay ; because it will bring lasting honors to himself.—*Dental Record.*

Poisoning by Lysol.—This antiseptic has caused the death of a child to whom it was administered by mistake, instead of a laxative. Dr. Haberda has shown that the poisonous action of lysol is due to its containing kresols. It cauterizes the skin and mucous membrane, and when absorbed it affects the brain and spinal cord, producing unconsciousness, general spasms, reduction of temperature, and bleeding into the uriniferous tubules. He therefore recommends that it should be prescribed only in dilute solution.—*Brit. Journ. Dental Science.*

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# HINTS, QUERIES, AND COMMENTS.

A System of Tipping to Prevent Fracture of Porcelain Facings in Bridge-work.—After having tried several methods of tipping facings in bridge-work, and having often seen the ill results of bridging without protecting the cutting-edges of porcelain, I find a most excellent method in the following. While it may have been used repeatedly by older practitioners, I offer it in the hope that it may benefit those who have had patients return with facings burst off their bridges,—not an infrequent occurrence in bridges inserted in the anterior part of the mouth. Taking any of the six anterior teeth, one or all for a single crown or a bridge of from one to six teeth, with No. 28 or 30 gauge pure gold, back line the facing, letting the gold extend over, being burnished to the cutting-edge and dressed off even with the *labial surface* of the facing. In backing with this piece of gold the pins are left standing in their original position. Cut another backing of 22-carat 28 or 30 gauge gold exact size of first backing, letting this piece extend beyond the cutting-edge instead of being bent and burnished down. After bending the pins and securely burnishing the backs of the pieces of gold to the facing, file toward the approximal sides, dressing the backings to an exact contact with the sides of the facing; invest (cutting-edge uppermost) in thinly mixed sand and plaster to where the first backing touches the labial surface of the facing; flow 20-carat solder along the edge. After cooling, this "solder edge" can be dressed and shaped to suit the case in charge. If the bite is a very close overlapping one, the facing may be ground from the pins toward the cutting-edge until the thickness desired is obtained; then proceed to back and tip as described. This thinning of the facing of course lessens the strength of the porcelain and renders it more liable to crack in soldering. Having thoroughly tested the merits of this process, I feel sure that where it is used porcelain facings are much more secure. These edges may be filed to a thinness so that but little gold is exposed, yet durability obtained.—FRED. R. SANDUSKY, Nashville, Tenn.

TO THE EDITOR OF THE DENTAL COSMOS:

*Sir*,—I notice in an article in the COSMOS for September from the pen of Dr. Black, that copper amalgam is recorded as a failure, and after giving some reasons for its abandonment by the profession, he concludes with a suggestion that the cause of the failure may be a question for the chemist. I would ask Dr. Black and any dentist who has failed to prevent the washouts complained of, to try the simple method which I adopted from the first, of using copper amalgam, and which I have found successful in giving good margins and in the salvation of teeth.

Finding it impossible to press out the surplus mercury after heating and crushing the copper amalgam in a mortar, I introduced and thoroughly mixed barely enough ordinary silver and tin filings to take up this surplus, and immediately filled the cavity or cavities for which it had been prepared, not allowing the mixture to set before using. If the Weygant copper amalgam is made too dry by the addition of too many filings, good results will not be obtained, so that one needs a little experience to arrive at a fair judgment as to the foregoing method. L. S. STRAW, Newburg, N. Y.

COAL OIL IN THE LABORATORY.—There is a little wrinkle that I have made use of for years, and that is the substitution of coal oil for other oils in the laboratory. Used freely on the oil-stone it keeps the latter fresh and clean, and there is left upon it no film of steel covering the surface of the stone and lessening its effectiveness. Used upon lathes, it removes all those gummy collections of old lubricants, and cleans journals and all other surfaces quite as well or better than does lye. It will remove many of the discoloring accumulations from the surfaces of fine wood-work. Use it to soak old instruments in, to remove rust, etc. It has a dozen uses.—H. H. B.

AIR-CHAMBERS.—If the always successful insertion of full upper plates in all materials, rubber, gold, aluminum, continuous gum, without air-chambers, lines made in the plaster cast, or other devices, does not demonstrate their uselessness, what further evidence is needed?

As a rule, it is rarely ever necessary to make any other change in the plaster model than a slight relief over the hard palate, so the plate shall not rock, as that is the only portion of the upper jaw which never changes nor yields to pressure. The plate will adhere just as well without this "relief."

I have on my shelves hundreds of models of every conceivable shape and condition of jaws, upon which metal plates have thus been made successfully.—L. P. HASKELL.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

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# LIST OF UNITED STATES PATENTS

## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING AUGUST, 1895.

*August 6.*—No. 543,854, to Charles H. Davis. Dental engine hand-piece coupling.
" " No. 543,855, to Francis N. Denison. Short-circuiting device for stopping dental motors.
" " No. 543,934, to Thomas Hollis. Tooth-brush charger.
" " No. 544,095, to M. R. Griswold. Dental flask.
" " No. 544,096, to M. R. Griswold. Dental articulator.
" " No. 544,106, to William B. Mann. Head-rest.
" " No. 544,135, to Joseph M. Strout. Dental clamp.
*August 13.*—No. 544,389, to William M. Seeger. Artificial tooth-crown.
" " No. 544,433, to A. L. Gilmer. Machine for polishing margins of cavities in teeth.
*August 27.*—No. 545,211, to C. F. F. Schroder. Mounting for artificial teeth.
" " No. 545,341, to W. P. Brown. Vulcanizing flask.
" " No. 545,389, to Joseph M. Strout. Dental matrix.

JAMES E. GARRETSON, A.M., M.D., D.D.S.

THE

# DENTAL COSMOS.

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## ORIGINAL COMMUNICATIONS.

### THE ESTHETIC CORRECTION OF FACIAL CONTOURS IN THE PRACTICE OF DENTAL ORTHOPEDIA.

BY C. S. CASE, M.D., D.D.S., CHICAGO, ILL.

(Read before the Tri-State Dental Meeting, Detroit, Mich., June 19, 1895.)

I USE the term "dental orthopedia" in preference to that of orthodontia because it is more applicable to our present advancement in this department of dentistry. The latter word, being derived from the two Greek words ὀρθός (orthos), straight, and ὀδους (odons), tooth, is confined to the straightening or regulating of the teeth; whereas the present definition of orthopedia—from ὀρθος (orthos), straight, and παῖς (pais), child—is "the surgical and mechanical correction of deformities of children and of deformities in general." The prefix "dental" localizes its scope to the region of the teeth. Its meaning now may be confined to straightening the position of the teeth, and also to the correction of all deformities that are due to a malposition of the teeth or that can be corrected through the medium of the teeth.

The correction of certain deformities of the face, or the esthetic remodeling of the natural features by changing the shape and surface contour of the bone over that region of the face that can be affected by force appliances attached to the teeth, has been the subject of numerous papers presented by me before leading dental societies. And as these have been widely published, I presume that the majority of my present hearers are well informed in regard to my claims, and the principles, at least, involved in the treatment I have proposed.

The principal object of presenting the subject at this meeting is to afford an opportunity to many who have been unable to see cases I have treated, or personally examine the plaster casts, which, I have reason to believe, speak far more eloquently of the truthfulness of what I have been able to accomplish in this class of dento-facial irregularities than it is possible for me to express in words.

Of these casts, which I here present, the larger portion have been selected from cases that were used to illustrate the papers read at the World's Columbian Dental Congress and the last March meeting of the Odontological Society of New York City, and published in the proceedings of these meetings. In addition, I now present the casts of three cases that have not been shown elsewhere (see Cases 3, 4, 5), the whole comprising every variety of that class of facial deformities that are due to a marked irregularity of the teeth accompanied by a facial defect that can be remedied only by a decided movement of the roots of the anterior superior teeth. This does not refer to the far more common deformities that are caused by a malposition of the crowns of the anterior superior teeth, nor does it include those very common forms of facial imperfections where, though the teeth themselves show no special irregularity, they can be used, without harm to their usefulness or position, as means for applying force that will result in a decided beautifying of the face.

I believe the time is not far distant when the skillful operator in dental orthopedia will be able to esthetically correct and beautify many common types of facial imperfection which we ordinarily recognize and denominate as "plain," "unattractive," and even "ugly."

This will be accomplished by force appliances attached to the teeth and worn for a few months during youth, or at a time when the immaturity of the bones permits them to yield most readily to the proper force, the teeth in these instances subserving the purpose of convenient places for attaching the appliances, and, through this medium, of directing and applying the force to the bones over that portion of the face which requires movement.

This subject is a new one, and, as Dr. Farrar has kindly remarked, "decidedly an advance step in orthodontia." It, moreover, pertains to a practice somewhat beyond the scope of dentistry proper, and yet one that cannot be touched by the general orthopedic surgeon, because it requires for its perfect accomplishment an intimate knowledge of the teeth and the manipulative skill of a dentist. I therefore present it to you for what it is worth, with the belief that those who care to give the subject any thought must be convinced of its possibilities after a careful examination of these models, leaving it for those who have been intimately associated with some of the cases I have treated to convince you of its practicability.

A second object of this paper will be to modify some of the sanguine expressions in my early publications on the subject.

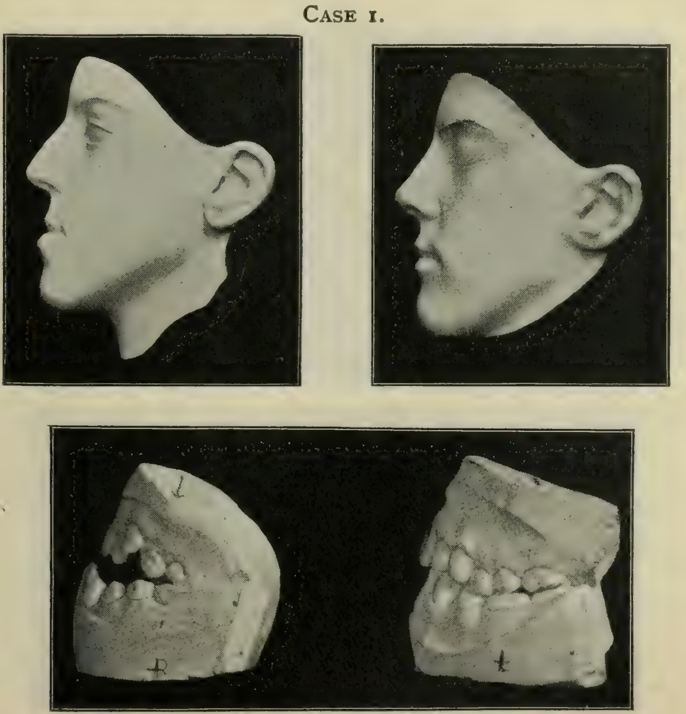
In the first half-dozen cases of this character which I treated, I was fortunate in meeting with no obstacle whatever. In fact, the very first case for which I invented the peculiar apparatus which I have used so successfully for applying force to the roots of the teeth responded so readily in every respect that I was able to make a greater change in the positions of the teeth and shape of the face than I have since been called upon to accomplish. (See Case 1, Miss S., age 13.)

By examining the plaster casts which were made at the beginning of the operation, it will be found that the upper dental arch was decidedly small and retracted, while the lower was large and prominent, with the peculiar open occlusion characteristic of a mouth-breather.

This gave to the face a long, narrow, and decidedly angular appearance. The lower lip protruded with an entire obliteration of its usual graceful curve, while the upper lip and middle features of the face were equally depressed. The lower part of the nose being drawn back by its muscular attachments to the depressed bone, assumed a thin and pinched appearance. Within seven months from the commencement of treatment, much to my surprise and the pleasure of all, this was corrected, and to-day, as has often been remarked, she is quite a handsome young lady,—the final model of her face hardly doing justice to her present appearance.

This and similar successes led me to the conclusion and published opinion that I could with perfect facility move the anterior portion of the superior maxillary process forward or back to any extent that a case might demand; and also to the statement that when force was applied to the anterior teeth in phalanx in the manner described, they would not move by virtue of the absorption of the walls of the sockets, as ordinarily occurs, but that the entire bony structure in which they were imbedded would be carried bodily forward or back with the roots.

Case I.

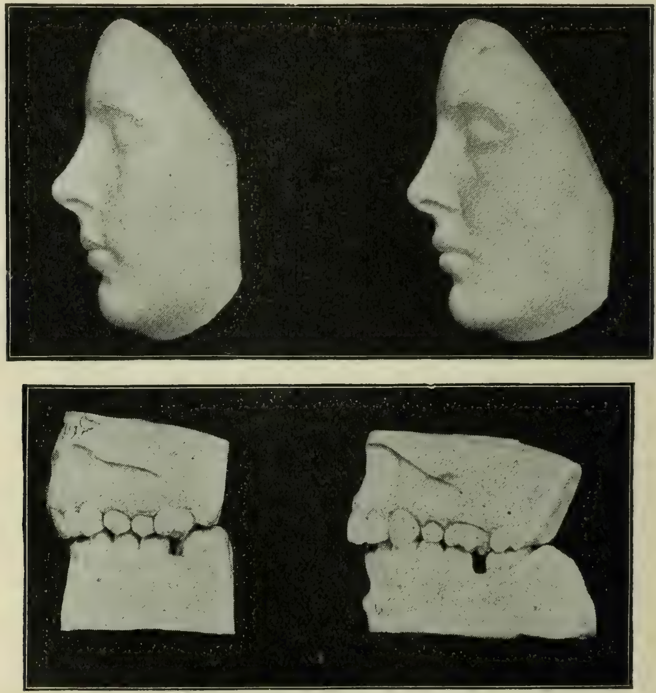


I now desire to say that I believe my original claims will hold good in nearly all cases where the treatment is attempted sufficiently early in life, but that instances will occasionally arise when the contrary seems to be true.

When abnormal prominence of the features occurs along the upper portion of the superior lip and lower portions of the nose, caused by the position of the roots of the anterior superior teeth and maxillary process, reduction can rarely be performed with ease. Especially is this true if caused by the anterior position of the roots of the cuspids. These roots being surrounded by the most massive and dense part of the superior maxillæ, in which they are deeply imbedded, together with the fact that their position is such that their movement bodily in a posterior direction necessarily requires the absorption of a large portion of bone, makes this operation one of the most difficult in dental orthopedia.

The posterior movement of the incisor roots is not as difficult, as can be well understood by examining a macerated skull. The bone in this region, because of its peculiar shape, will usually respond to the proper force by bending bodily.

CASE 2.



Especially is this true when force is applied in the anterior direction, as is well shown by the casts of a number of the cases which I have brought for your inspection. And while this movement in a posterior direction would theoretically seem to be impossible for an adult on account of the position and early ossification of the vomer, I am pleased to call your attention particularly to the practical demonstration of this principle for patients older than eighteen.

Case 2 is that of a young lady who was twenty years of age when I commenced treatment.

It will be seen by an examination of the models that the roots of the anterior teeth, at the beginning of the operation, were very prominent. The crowns of the incisors being inclined inward, gave to the face a bulged and very unhappy expression along the superior portion of the upper lip, affecting the shape of the nose. You will see the same expression in the beginning face model of Case 3. This condition, more or less intensified, is not an uncommon one. If you have not often observed it among your patients and others, it is because you have not learned to classify it among the conditions which demand your skill.

The teeth of these persons are often in proper alignment, and through long habit and avocation you proceed to treat them with little heed to the facial defect which their position produces. If you think of it at all, it is to become conscious that the face is homely, plain, or ugly,—made that way,—unchangeable.

And so the subject is dismissed as one which makes no appeal to you ; yet this, as well as many other facial imperfections that are produced by a malposition of the teeth, is a condition which, if taken early, can be remedied with no great difficulty ; and in doing so you will confer one of the greatest of human blessings. Now see what I have accomplished for this young lady. Notice in the final model of her face the improvement in the shape of her nose, the ease and graceful curve of her upper lip, and the natural pose and perfection of her mouth. To-day she possesses a face of more than passing beauty, produced from one that was, to say the least, exceedingly plain and unattractive. Nor is it possible for you, as in other cases, to fully appreciate the change by these models, the difference in all these cases being far more marked in conversation.

But what of the difficulties? Please to remember that a person over twenty years of age is not a typical case for moving the roots of the six anterior teeth in a posterior direction.

The wonder is that I was able to accomplish so much. The first bicuspids were extracted. The second bicuspid and molars on each side were banded, and the bands firmly united and cemented to the teeth. From these anchorage attachments the reciprocating force bars extended to the anterior teeth, as will be described later. For nearly one year the great power of this apparatus was continually exerted in forcing the roots of the six anterior teeth and their surrounding bone to take a more posterior position. During this time the spaces produced by the extraction of the bicuspids were entirely closed ; and, as a proof of the amount of force that was used, this was accomplished almost wholly by a forward movement of the posterior teeth ; not by tipping their crowns forward, but by bodily moving them almost in an upright position through the process. For, as will be observed by a careful study of the models, the anterior teeth at their cervices have been forced back but very little. The occluding ends of the teeth, especially of the incisors, have been forced slightly forward. The great force being exerted at their roots seems to have moved the apices back at least one-eighth of an inch. Fig. 1 fairly represents the original relative position of the central incisors during a masticating occlusion, and Fig. 2 the present position.

Case 3 is that of a young man who was eighteen years of age when I commenced treatment a little over one year ago. The teeth are large and strong, jaws and bones proportionately large and rigid. The facial prominence or bulging of the face in the region of the wings of the nose was far more pronounced than was the former case, and unfortunately due largely to the anterior position of the roots of the cuspids. After the first bicuspids were extracted, anchorage attachments were made for the posterior teeth as before, but the reciprocating force bars extended only to the cuspids. The

FIG. 1.

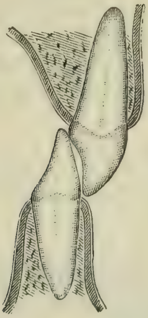
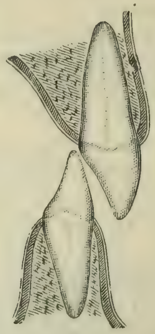
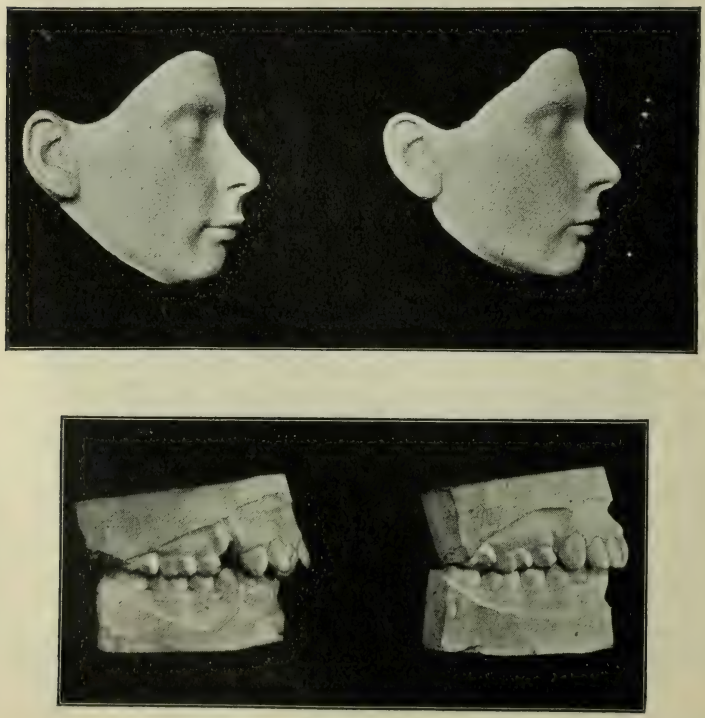


FIG. 2.



CASE 3.

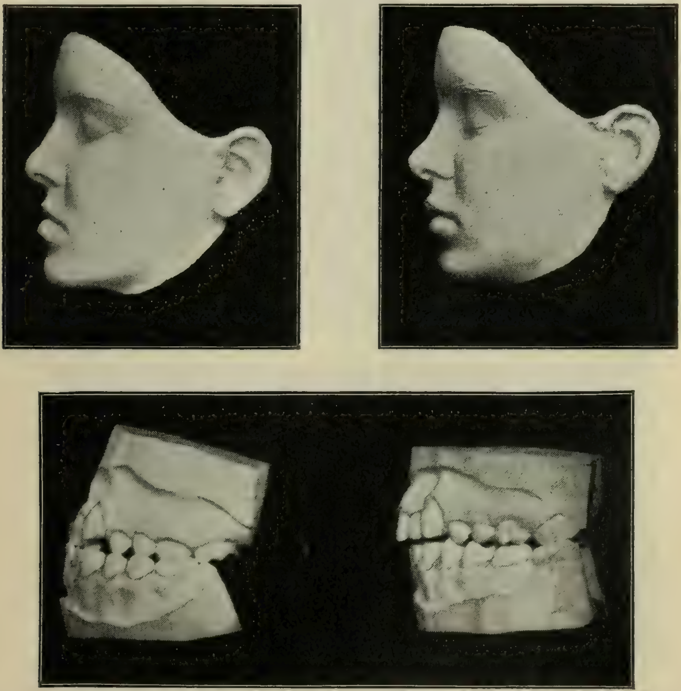


anchorage was further enforced in this case by rubber bands extending from the upper attachment of the cuspids to the posterior ends of a bar that was attached to all of the lower teeth, as has been repeatedly described by me elsewhere.

The power of this apparatus was continued from May, 1894, for eight months, since which time to June 10, 1895, the incisors have been included by an extension of the force bars. I removed the apparatus at this time for the purpose of taking impressions to bring the models of the case before you in its present incomplete state.

The bicuspid spaces have been closed partly by the forward movement of the anchorage teeth, but not so much as in the former case; nor have I been able to retain them in as upright a position. The roots of the cuspids, which seemed to present an almost insurmountable resistance to far more force than I have ever employed in any other case, have moved appreciably, but not as much as I hoped. I leave it for you to judge of the improvement, which is quite marked in some particulars, not shown by the face models, and due to the regulation of the incisors.

CASE 4.



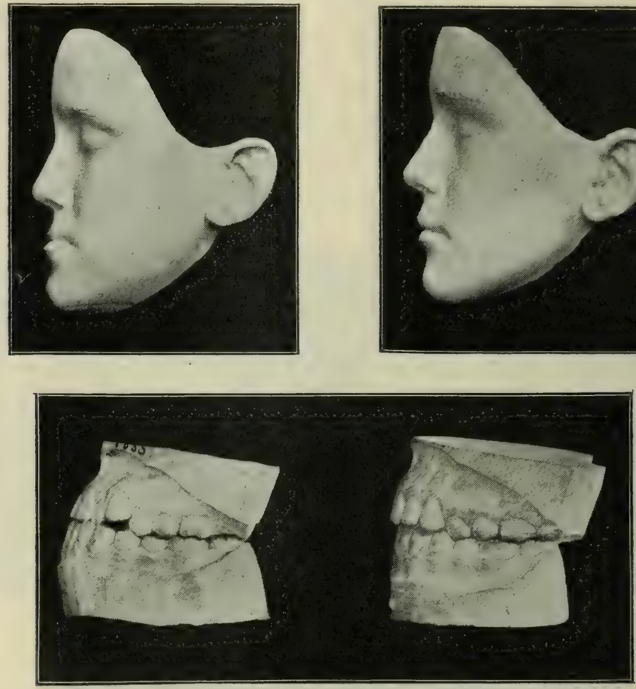
Now, I wish to introduce to your notice two cases, 4 and 5, which are the only ones where I have attempted a forward movement of the roots of the superior incisors that the surrounding process and immediately adjoining bone did not move bodily forward with the teeth.

Case 4, Miss J., aged sixteen, commenced treatment September 12, 1894.

Case 5, Miss F., aged fourteen, commenced treatment September 22, 1894.

In both these cases, as soon as there was an appreciable movement it was accompanied by a decided prominence over each root, showing that the roots had moved by the immediate absorption of the alveoli and the bending outward of the anterior alveolar plate. In one instance, before my attention was called to it, I could distinctly see the shape and position of the apices of some of the roots, which looked as if they were just ready to burst through the gum. Whenever this condition seemed to endanger the possibilities of success, the force was reduced, but not sufficient to allow the roots to return. Then I would wait for the ridges to be evened up by nature building in new tissue, when force would be again applied for a little further movement.

CASE 5.



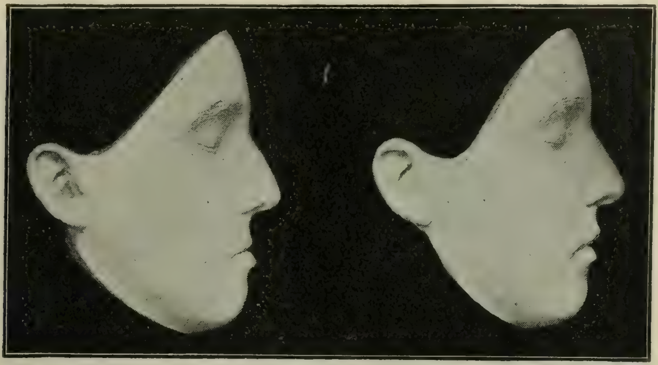
The necessity of these interruptions in the progress of the movement has required for these operations a much longer time than would otherwise have been necessary, and, though neither are complete, the present results are quite satisfactory as regards the possibility of bringing about the desired position of the teeth.

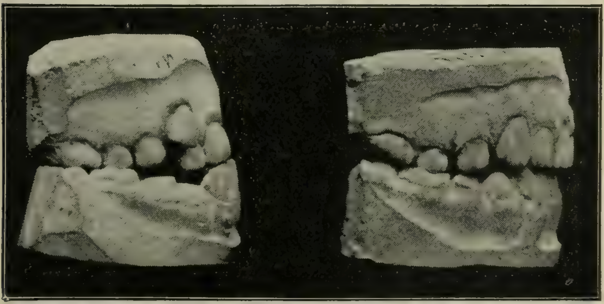
Considered, however, from the standpoint of esthetic facial development, they can never be as successful as they would have been had I been able to command a movement of a greater area of the superior maxillary bones. Had the teeth in many other cases I have treated moved in the same manner, they would have proven utter failures in the main object that was successfully attained, because they required something more than the mere movement of the roots and alveolar process. And this is true, though fortunately to a somewhat less extent, of these cases.

Before proceeding with the reading of the remainder of my paper, which pertains to the construction of apparatus, I will briefly describe the models of other cases I have brought for your examination, and which have been used to illustrate other papers presented at other meetings.

Case 6, Miss M., aged sixteen; commenced treatment December 26, 1893; staying bands October 15, 1894.

Case 6.





In this case the upper jaw was too small for the teeth, which were greatly crowded, and with the cuspids, as will be seen, in their customary positions under these conditions. The dental arch was lacking in its anterior extension rather than width, the incisors being quite posteriorly placed as regards the other teeth, producing a marked depression of the upper lip that was decidedly inharmonious, to say the least. In preparing it for the application of the contouring apparatus, the crowns of the incisors were first forced forward with jack-screws, and the cuspids crowded down more nearly into alignment.

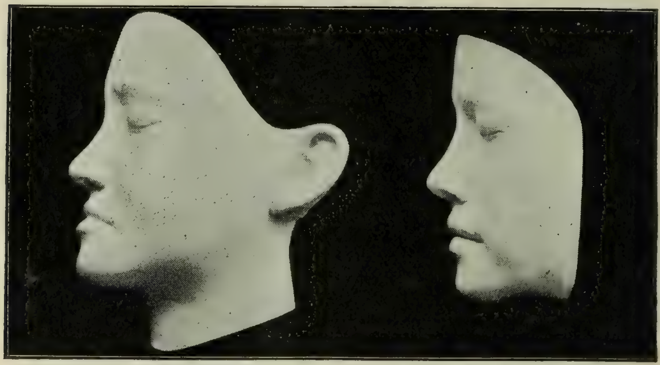
At this stage in the operation, models of the case were exhibited at the Illinois State Dental Society, to show the common facial result of the ordinary method of correcting this character of irregularity.

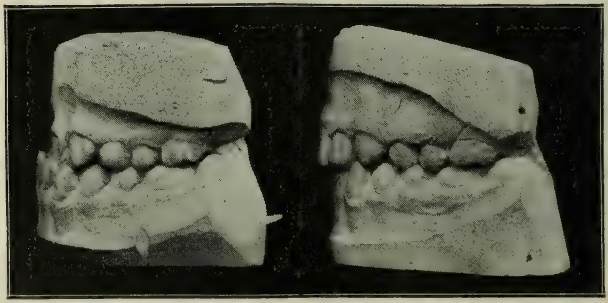
The crowns of the incisors were pushed forward at a considerable angle, and all the teeth were crowded, with contracted interproximate spaces. The incisive fossæ seemed deeper than ever, while the facial imperfection was unimproved.

Now, mark the change which occurred after wearing this, the contouring apparatus, four months. Notice the upright position of the incisors, and the ample room that has been obtained for all the teeth; and, moreover, this change has produced, as in other instances, a decidedly favorable improvement in the face.

Case 7 is that of a girl, thirteen years of age when I commenced treatment, and which was finished in six months.

Case 7.





I wish you to particularly examine this case, because, more than all the rest, it exemplifies the entire movement of the incisors and intermaxillary process, without the slightest apparent change in the position of any of the other teeth, with the exception of the cuspids, which were allowed to fall into more perfect alignment.

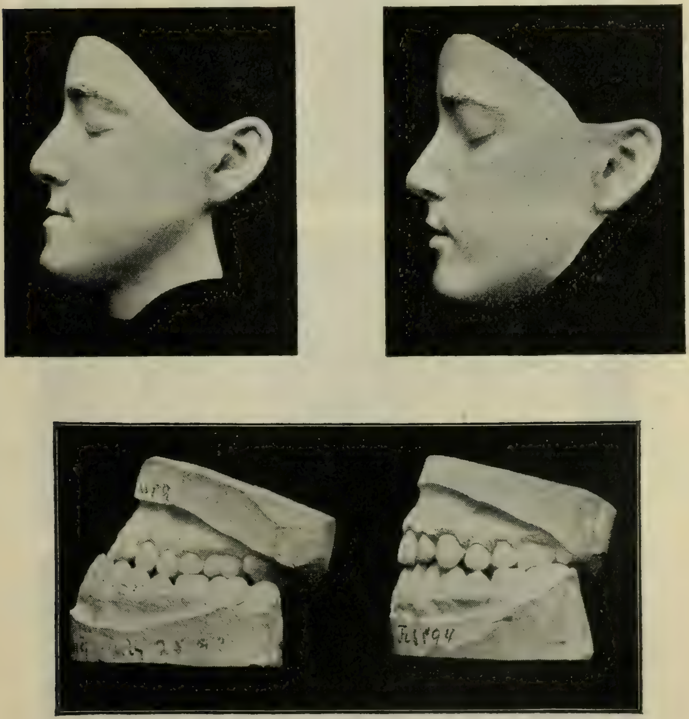
Case 8 is that of a Jewess, thirteen years of age, which was also finished in less than six months.

This was an inherited family type, and one that is often mistaken for a prognathous jaw, and occasionally treated with a submental splint and head-gear, in an attempt to force the chin back. The superior maxilla was so small and retracted that the teeth flared outward to meet the lowers.

Treatment in this case consisted in expanding the dental arch forward and laterally, and so applying the force that there was a much greater movement of the roots than the crowns of the teeth. This resulted happily in a general enlargement of the maxillary process, with a much fuller contour to the middle features of the face, even to straightening the nose, as in Case 1.

Case 9 is that of a boy, fourteen years of age, which I will leave for Dr. Cushing to describe, as it is one of the cases he referred to me.

Case 8.

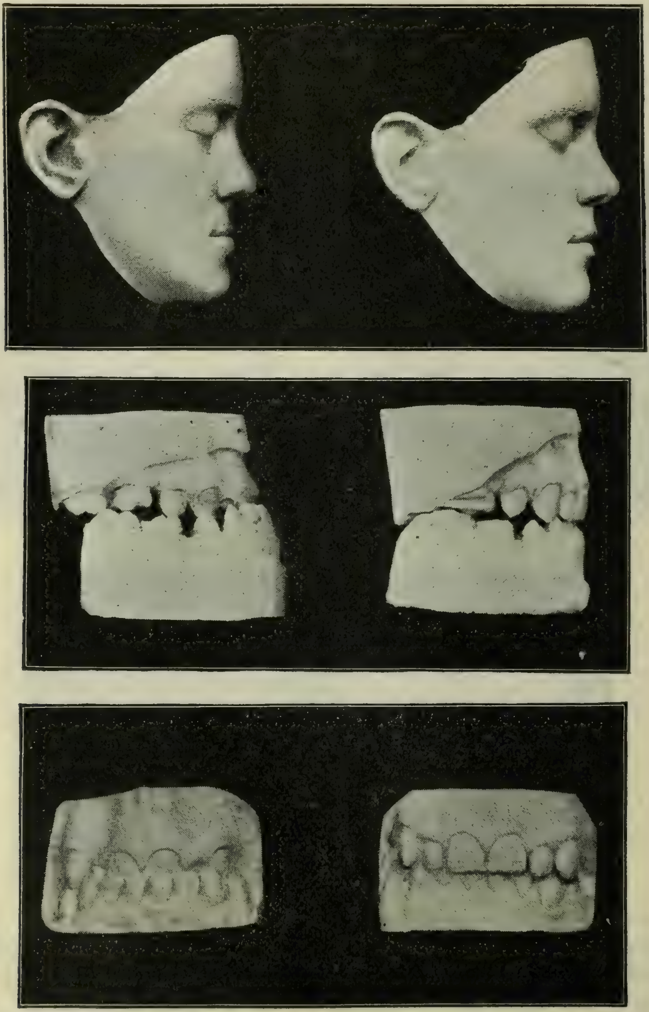


In answer to numerous inquiries, I have decided, in this connection, to describe and fully illustrate some of the important features of the latest methods I have adopted in the construction and application of the contouring apparatus.

I do this with the hope that some of the difficulties I encountered in my first cases may be avoided by you, and which were partly due to the comparatively crude construction and application of the apparatus I used then and published in my early writings upon this subject.

"The limited area upon which force can be applied to a tooth, compared to that portion covered by the gum and imbedded in a bony socket, has made it next to impossible, with all ordinary methods, to move the apex of the root in the direction of the applied force ; nor could this ever be accomplished with force exerted in the usual way at one point upon the crown, however near the margin of the gum it be applied, for the opposing margin of the alveolar socket must receive the magnitude of this direct force, and in proportion to its resistance it will become a fulcrum, exerting a tendency to move the apex of the root in the opposite direction.''

Case 9.



But if in the construction of the apparatus a static fulcrum is created, independent of the alveolus, at a point near the occluding portion of the crown, while the power is applied at a point as far upon the root as the mechanical and other opportunities of the case will permit, the apparatus becomes a lever of the third kind, the power being directed to a movement of the entire root in the direction of the applied force.

This proposition is made plain by reference to the diagrams. In Fig. 3, let *A* be a point upon a central incisor, at which force is applied in the direction indicated by the arrow, then will the opposing wall, *B*, of the alveolar socket, near its margin, receive nearly all of the direct force, and in proportion to its resistance will there be a tendency to move the root in the opposite direction. This proposition will also hold good even if we apply the force at *A*, Fig. 4, or as far upon the root as may be permitted, by attaching a rigid upright bar, *C*, to the anterior surface of the crown; the only difference being that we distribute the direct force over a greater area. But if, as in Fig. 5, we attach to the lower end of *C* a traction-wire or bar, *F*, and further enforce the mechanical principles of our machine by uniting its posterior attachment to the anchorage of the power bar *P*, we will have neutralized our anchorage force materially and created an independent static fulcrum at *D*. Our apparatus now will distribute its force over the entire root, and give us complete direction and control of whatever power we put into it.

FIG. 3.

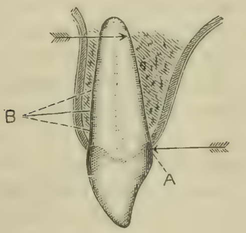


FIG. 4.

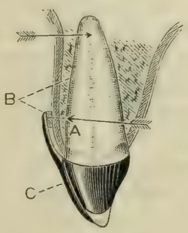
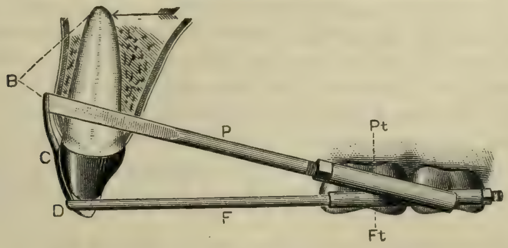


FIG. 5.



The entire tooth can be carried forward bodily, or either end can be made to move the more rapidly. The force thus directed to the ends of the roots will have an increased tendency to move the more or less yielding cartilaginous bone in which they are imbedded.

For material for regulating appliances I prefer German silver, not because of its inexpensiveness, but because much experience with all metals has taught me that none possess the same favorable qualities for this work.

The bands which surround the teeth should be wide and thin. If

No. 10 B. & S. gauge wire is rolled to four, or four and a half thousandths of an inch, it will usually be about the right width. This banding material should be drawn firmly around the natural teeth, the ends bent sharply to a right-angle for the joint. When these are soldered, the joint should project about a thirty-second of an inch, with its sharp corners clipped. Then the bands should be carefully fitted and burnished to the teeth with the joints a little to one side of the center of their anterior faces, to allow the upright bar to take its proper position, exactly in the center and parallel with the long axis of the tooth, and also to serve as a strengthening girder to the attachment. These and other small details may seem unnecessary, and yet, practically, they are of vital importance in the construction and application of the apparatus. It will be remembered that I originally made these upright bars of flattened No. 18 wire, leaving the ends long enough to bend over when in place, and clasp the force bars. The operation of bending the bars was often a difficult and painful one, especially when it became necessary to remove and recement a band.

For upright bars I now cut pieces from Nos. 15 or 16 wire, about three-fourths of an inch long. These are filed slightly at the middle to receive the band, to which they are firmly soldered in the position described. Then they are bent and filed so as to fit perfectly the face of the tooth against which they are to rest. They should also follow the curve of the gum, nearly touching it, and extend above its free margin about one-fourth of an inch. The perfecting of these can only be accomplished at the chair. Finally the bar is shaped with a file according to whether force is to be applied in an anterior or a posterior direction.

I will first describe the method of procedure for cases which require a forward movement of the roots. In cases of this character I have never found it necessary to apply force to other roots than those of the incisors. The cuspids are usually retarded from taking their positions of alignment by the posterior position of the incisors, and are frequently so prominent that it first becomes necessary to force the crowns of the incisors forward with jack-screws or otherwise before the contouring apparatus can be effectively placed.

Usually in those conditions when the cuspids interfere, the upper ends of the upright bars can be at first ligated to the power bar, and thus the incisors forced forward until the power bar can be slipped into its proper position, which, as will be described, is always back of the upper end of the upright bars, against which it presses for the purpose of exerting force as high as possible upon the roots to be moved.

The posterior surface of that portion of the upright bars which stands in front of the gum is filed flat, so that their antero-posterior thickness tapers to one-half their original diameter at the ends, where they serve as rests for the power bar.

The anterior surfaces of the ends are rounded and polished to a thin edge. These ends should not extend above the upper edge of the power bar, unless it seems necessary to bend them at the extreme end to form a catch to prevent the power bar from sliding up.

The lower ends are grooved with a small round file to receive the fulcrum bar, which is a wire (No. 22 or 20), threaded only at one end in the No. 12 or 11 hole of the Martin screw-plate, the other end being held in place by bending it back after passing it through the lower anchorage tube.

The power bar should be made with the greatest care, in order that it be of the required rigidity and strength. Extra hard German silver wire, No. 10, should be drawn without annealing to Nos. 13 to 16,—the size being regulated by the probable power necessary, and also by the distance from points of attachment and application. In other words,—when the anterior end of the anchorage tube (*Pt*) at which the nut works is even with the bicuspids or at no great distance from the points of applying the force, less rigidity of the bar will be requisite ; and again, for very young patients or where little power will be needed for the required movements. Ordinarily, however, No. 13 will not be found too large.

When it has been drawn to the proper size or selected and cut about the right length, that portion which is to extend between the right and left first bicuspids should be flattened in the rollers to about one-half its diameter. Then it should be bent so as to conform to the shape of the gum along the line where it is to rest. After bending closely over the cuspids, it should extend straight back into the tubes, into which its threaded ends should pass from one-half to three-fourths of an inch.

For more complete direction in the proper method of cutting a screw, making drills, taps, and nuts, I refer you to other writings where I have fully described the process.

The construction of the anchorage attachment which now remains to be described is of the greatest importance to the ease and accuracy of its application and subsequent usefulness.

Two molars, or the first molar and a bicuspid, and sometimes all three, should be selected for the anchorage teeth. When these are accurately fitted with wide bands, an impression in compound, of one side at a time, including the cuspids, should be taken. The bands should then be removed from the teeth without bending, and carefully placed in their proper position in the impression, which should be filled with Teague's or other investing compounds. You now have the bands upon a small model that will hold them firmly in their proper relative positions during all the soldering process.

As the position and mechanical perfection of the power tube (*Pt*, Fig. 5) is of paramount importance, it should receive first attention.

Select a strong tube one-half or three-fourths of an inch long, that loosely fits the threaded end of the bar. Its anterior end should be placed so that the nut will work freely upon the bar without impingement upon band, tooth, or gum, and it should take a direction that points exactly to that place upon the cuspid over which the power bar is to extend. In order to strictly observe this important direction, it usually becomes necessary to raise one or the other end of the tube from the bands by the intervention of lifts. It is often convenient to rest its posterior end upon the lever tube, its sharp projecting edges being rounded so as not to irritate the cheek.

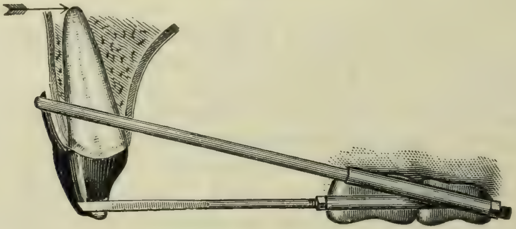
The lever tube (*Ft*, Fig. 5) should also loosely fit its bar or wire, and be soldered directly to the bands, which it firmly unites, and thus serves to give statical strength to the anchorage. Their direction is not as material as that of the power tubes, because of the smallness and flexibility of the lever wire. Their posterior ends should project sufficiently free from the other parts to admit of the working of the nut. And in those instances where reciprocating rubber bands are to extend to a lower appliance,—the advantage of which has been explained elsewhere,—I allow these tubes to project for that purpose, finding them much more convenient than the buttons which I formerly used.

The tubes now being fitted with their joints turned toward the bands, they are attached with an abundance of silver solder, the bands also being united along their approximal surfaces.

All the parts which have undergone the soldering process are now boiled in sulfuric acid to remove the borax and oxid, after which the entire apparatus is polished and heavily gold-plated.

The teeth being properly separated with wax tape, the anchorage appliances should first be fitted to place in the mouth, and the cement allowed to harden before proceeding further, to prevent dislodgment by the force necessary in placing the power bar in position, especially as it often becomes necessary to remove and rebend the bar several times in the final perfecting of its shape.

FIG. 6.



With the anchorage appliances and power bar in place, the bands for the anterior teeth may now be fitted and cemented, allowing the upper ends of the upright bars to rest in front of the power bar. Finally, the lever bar is placed, and the contouring apparatus is ready to commence the application of force at the next sitting.

An apparatus for moving the roots of the anterior teeth in a posterior direction is in the main constructed quite similarly. (See Fig. 6.) The power bar now being used for traction force, the same rigidity is not as necessary as in the other apparatus. I find, therefore, that a No. 16 wire, not flattened in front, is of sufficient size.

The other, or lever bar, the force of which acts in the opposite direction to prevent the occluding ends of the teeth from being drawn back, should be as large as No. 18. It should be flattened in the same manner described for the power bar. The upper ends of the upright bars are grooved on their anterior surfaces to form a rest for the power bar; while a shoulder is filed on the posterior surface of the lower ends, which forms a slot, when in place, for the flattened lever bar to rest.

It being understood with this apparatus that the power bar nuts work at the posterior ends of the tubes, while those of the lever bar work at the anterior ends. Proper provisions for this arrangement should be made when constructing the anchorage appliances.

# PULP-MUMMIFICATION.

BY THEODORE SÖDERBERG, DENTIST, SYDNEY, AUSTRALIA.

IN the DENTAL COSMOS for May, 1893, Dr. W. E. Christensen communicated some comments on the Witzel and Herbst methods of treating devitalized pulps, and pointed out that the real effect aimed at by the two German dentists was the *mummification* of the pulps left untouched in root-canals.

Previous to reading about "this treatment, which we may call simple, and at the same time scientific," I had followed the usually thought and practiced method of treating devitalized pulps, viz, to give my patients just the amount of strain and pain equivalent to the amount of my own bull-dog perseverance with that exquisite instrument of torture—the nerve-broach ; then *trying* to fill the canals with gutta-percha or asbestos fibers saturated with some antiseptic ; and then—well, the final result was not always my patient's comfort and my own glory.

I discarded the old method and adopted Dr. Witzel's, commencing by using the following modified formula (his paste, as formulated by Dr. Christensen, being too thin to be workable) :

Hydrarg. bichlor. corr., gr. xxx ;
Morph. muriat., gr. xv ;
Ac. phenyl., gr. x ;
Ol. menth. pip., gtt. j ;
Ol. caryophyl., gtt. j ;
Alum. exsiccat., q. s. to make stiff paste.

This paste had, however, the drawback which all pastes containing mercury have,—it caused discoloration of the tooth, at least when used in connection with steel instruments and amalgam.

Shortly afterward (September, 1893) the DENTAL COSMOS brought out Dr. W. D. Miller's valuable contribution : "Concerning Various Methods advocated for Obviating the Necessity of Extracting Devitalized Tooth-pulps," and I at once commenced to experiment with different pastes to find one which would cause mummification of the pulp without discoloration of the tooth.

The properties of an ideal mummification paste can be shortly described thus :

1. It must contain an antiseptic sufficiently strong to prevent decomposition taking place while mummification sets in. Once mummified, the pulp is (so at least I believe) not very likely to become decomposed and putrid.

2. It must contain an ingredient which will, as quickly as possible, cause mummification (drying, shriveling) of the pulp-tissues.

3. It must contain a substance which, in conjunction with the other ingredients, will impart a white color to the mummified pulp, and prevent discoloration of the tooth.

4. It must contain an agent capable of binding the whole compound together in a pasty state, and making it penetrate deeply and quickly.

Dr. Miller enumerates yet other points ; but the above are, I believe, sufficient for all practical purposes.

Besides Dr. Witzel's paste, as given above, I have experimented with three of Dr. Miller's formulæ, using glycerol as the binding agent, viz :

Sublimate, } equal parts;
Thymol, }
Glycerol, q. s.

Sublimate, }
Thymol, } equal parts;
Tannin, }
Glycerol, q. s.

Ol. cassia,
Thymol, q. s.

Here, again, the disadvantage is—as pointed out by Dr. Miller—the discoloration of the tooth, bluish-black by the mercury, yellowish-brown by the oil of cassia. My test-tubes further show that where tannin is used in connection with either of these, or any other paste,—especially if glycerol be used as the binding agent,—the discoloration is more marked.

Experiments with twelve other pastes, first in test-tubes, next with freshly-extracted teeth, proved to my preliminary satisfaction that the following formula was the most reliable on the four points above enumerated :

Dried alum, ʒ i ;
Thymol, ʒ i ;
Glycerol, ʒ i ;
Zinc oxid, q. s. to make stiff paste.

In this paste the thymol acts as the antiseptic, the alum as the mummifying agent, the zinc oxid as the coloring medium, and the glycerol as the binding and penetrating agent.

Bearing in mind Dr. Miller's favorable recommendation of thymol, I adopted it as my antiseptic, and I fancy that I shall not have cause to regret my choice. My reason for adopting dried alum was that its tanning properties are far superior to those of tannin or any other tanning agent,—a statement which any practical tanner will indorse.* Further, dried alum does not discolor the paste, while tannic acid, if substituted for the alum in the above mixture, produces a dark-brown paste.

I need hardly point out that glycerol, with its great affinity for moisture and its well-known penetrative power, is an excellent carrying agent for all mummification pastes ; further, that no better coloring medium can be found for the purpose in view than zinc oxid.

The entire paste is, finally, non-irritating ; I have, in fact, continually used it for other purposes, *e. g.*, in deep cavities between pulp and filling-material, etc.

I have used this particular paste for over twelve months, and, *so far*, not one single case out of a total of ninety-seven has given any after-trouble (alveolar abscess). And here I may be allowed to state that neither have I, so far, had any after-trouble with any of the cases treated with Dr. Witzel's paste (from August, 1893, to date). I am perfectly well aware that neither one year, nor two, is sufficient time to warrant a guarantee of absolute success, and I acknowledge the truth of Dr. Miller's words, "Granted that the pulp becomes sterilized by the application, this does not say that it remains sterile indefinitely."

I must here point out that my claims as a bacteriologist are nil, and as far as experimental chemistry is concerned, my knowledge is only that of the average educated dentist. I am unable to make experiments with mummified pulps on infected agar culture, and I am unable to give the "higher scientific reasons" why and how the paste acts as it does. All I know is that it *does* act mummifyingly on the dead pulp, and that twelve months after that mummy is still a mummy, and not a soft, stinking horror.

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*I have it on the authority of the senior partner of the largest tanning establishment in Sydney (Ludowici & Sons) that an ox-hide can be tanned with dried alum in less than one-tenth the time that any other substance consumes in the process.

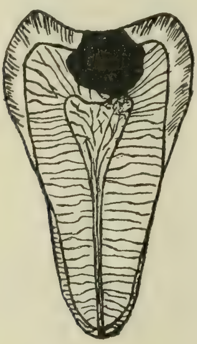
My patients mostly belong to the so-called middle and working classes. For divers reasons, they are not as careful with their teeth as are the members of the more cultured and moneyed classes ; they don't, as a rule, think of visiting the dentist except when an exposed pulp acts as a vivid reminder. In short, my practice is such a one that I have to resort to my devitalizing paste very frequently. Hence excellent opportunities to use and observe the effect of the mummification paste. (And hence, also, the "kind o' sickly smile" wherewith I point out to my pupils Dr. Miller's angelic advice : "One or two cases every month—at least for the first year or two—is all that a careful dentist ought to risk in private practice." It is, however, a great consolation to me to read in the same article that over two hundred cases were treated with Dr. Miller's paste at the Dental Institute of the University of Berlin, with only one failure on record.) I have tested the action of the mummification paste in the way that conforms best with my bent of mind and my inferior standard of scientific education : I have removed test fillings three, six, nine, and twelve months after the pulp-treatment took place. In all cases the same satisfactory result observed—mummification of the pulp. One case I especially wish to record. I had occasion to extract an upper third molar treated seventeen days previously. On immediately splitting the tooth, I found the pulp in the root-canals perfectly mummified down to the very foramina. Whether the experiments are carried out with teeth *in situ*, or with extracted teeth, the mummified pulps always present the same appearance, viz : a perfectly dry, parchment-like mass, with a faint odor of thymol, and a whitish color.

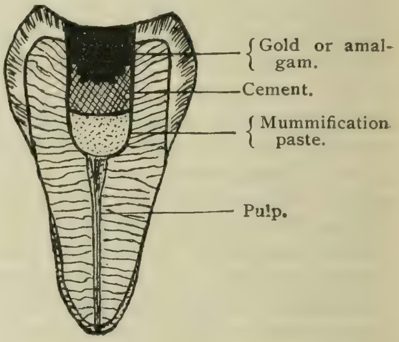
My mode of procedure is as follows : After the pulp has been perfectly devitalized (arsenic, cocain, alum, equal parts, glycerol q. s., sealing with sticky wax), I open up the main pulp-chamber and drill out its dead contents, leaving the root-canals untouched. I then fill the chamber with paste, and with a flexible Donaldson bristle gently prick the paste into the pulps left in the canals (this, however, not absolutely necessary). I now seal with cement and insert amalgam or gold, as case may be. I use rubber-dam or cup where possible, otherwise Sperling's rolls—the main thing being to keep out the saliva, at least until the first piece of amalgam has been inserted and burnished round.

A good thing cannot be repeated too often. I therefore take the liberty to borrow two of Dr. Christensen's illustrations accompanying his article above referred to, showing, this time, my way of placing paste and filling.

Again I must turn to Dr. Miller's article for a valuable quotation : "No dentist who has an appreciation of the needs of the public at large, and does not confine his sphere of thought to the limits of his own practice (with fifty dollars to one hundred dollars for treating a tooth), can question the statement that our present methods of treating many molars with dead pulps are difficult, expensive, and, in the hands of the majority, uncertain. The only alternative of extirpating the pulp is leaving it in. Having left the pulp in the canal, shall we leave it in the shape of a putrescible matter, or shall we endeavor, in some way, to render it non-putrescible? The latter method appears to me to be the more rational.'' If this is not granite logic, I, for one, am at a loss whither to turn to find it.

I am too bashful to approach with advice those of my confrères from the country of truthful George Washington who claim to be able to extract all pulps with a nerve-broach, and to fill all canals with gold or gutta-percha. But those less expert dentists who, like myself, have wasted much perspiration and temper over the broach, I sincerely advise to give the mummification process a trial, and then to ''observe, compare, reflect, record'' the results.





I shall feel happy if this short contribution fulfills its aim,—to bestow upon at least some of my fellow-dentists, be it ever so little of that identical relief and benefit I myself have derived through Drs. Christensen's and Miller's articles. And I shall feel more than satisfied if some American or German dentist with a higher scientific standard than my own would deem it worth his while to put my paste, and pulps treated with it, to stringent chemical and bacteriological tests.

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# VACUUM CHAMBERS AND THEIR POSITION; AND AN ODD DENTURE.

BY HENRY H. BURCHARD, D.D.S., M.D., PHILADELPHIA, PA.

It is asserted by many that the vacuum chamber serves no useful end as a means of retention for artificial dentures. By others it is affirmed that its office is but temporary.

The former believing that an equally firm adhesion of a plate to the vault and arch may be secured by well-fitting plates made without chambers; the latter maintaining that the chamber serves as an aid to retention during that period in which the patient is becoming accustomed to the presence and to the management of a plate.

The first opinion or hypothesis is best answered and refuted by a reference to plates which have had an accidental perforation of a wall of the chamber. The admission of air to the space of the chamber is followed by almost total loss of adhesion.

If the function of the chamber were not intimately associated with retention of the denture, this perforation should be followed by but slight loss of adhesion.

Closing the opening, re-establishes the original function.

No doubt there are many cases in which a satisfactory contact and stability are obtainable without the use of a chamber, but the writer has never seen a case in which a greater adhesion, an increased and permanent stability was not secured by the use of a chamber, of the proper dimensions and position.

The second hypothesis, that the function of the chamber is but temporary, ceasing with the improved plate adaptation which occurs after the piece has been worn for a period. That the soft tissues fill the chamber and destroy its function

Observation of a number of cases will show, or, better, actual tests upon plaster models will show that in but a small percentage of cases is the chamber ever even approximately filled, and then only when broad and shallow, or undercut chambers have been used for cases having soft, flabby tissues. Again, in any case, test the effect of the absence of the chamber by temporarily filling the space with wax, a marked loss of adhesion occurs.

The writer has always held that the chamber has a positive and enduring function, and that it did constitute, in a great measure, a vacuum chamber ; a depression from which the air is almost exhausted.

The act of sucking up a plate consists, first, of those tongue movements associated with the inception of the process of deglutition ; the organ is swept antero-posteriorly, progressively forcing the plate in contact with the palatal mucous membrane.

Accompanying the tongue movement is the effort to create a vacuum in the dental vault, so that the air is withdrawn from the chamber and escapes at the posterior edge of the plate. When the act of suction ceases, the plate has been pressed into close contact with the mucous membrane. Around the center of the plate, the air chamber, is an area having an air pressure greater upon its external surface than in its interior.

This difference of pressure is sufficient to cause the plate to be held firmly against the soft tissues. At the area of partial vacuum the soft tissues are pressed into the space ; the plate pressure is present everywhere, except at this area, hence the protuberance into the vacuum space.

The slight movement, common or usual with plates during mastication, tends to separate it from the mucous membrane and permit the access of air to its under surface.

The line of least movement, as the movement is lateral, a rocking from side to side, is along the median line of the vault ; and as the concavity of the hard palate is usually of an irregular vault form, the point of least movement is near its apex. If the movement does not extend to an edge of the chamber, the stability of the plate is not materially affected ; but when one of these edges loses its contact, air enters the chamber and adhesion is destroyed.

The more closely the edges of the chamber approximate this line, the less tendency to disturbance there is, so that comparatively narrow chambers are to be preferred ; but the depression should be of sufficient size to not materially lessen the effects of partial vacuum.

Naturally, the chamber should be in the area of greatest stability, that of least movement.

This area will be found around and about the center of gravity, and in shape resembling the outlines of the dental arch.

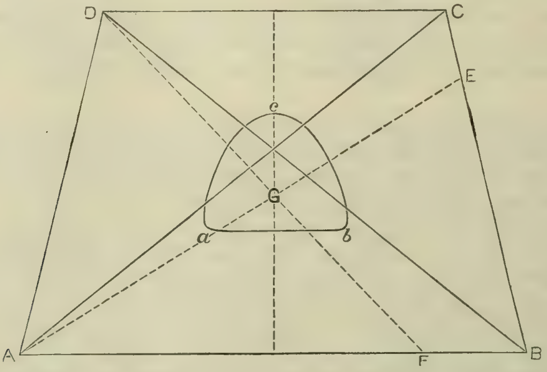
The dental arch represents, approximately, a parabola in outline.

This incloses a trapezoid, the centers of the cuspids marking the extremities of the short, the centers of the third molars those of the long parallel side. Straight lines, joining these points, complete the figure.

The center of gravity of a trapezoid is found by suspending it first by one obtuse angle, and next by one of the acute angles ; vertical lines dropped from the points of suspension will, in intersecting, mark the center of gravity.

Thus, on the figure A, B, C, D, suspend it first from the angle A, D, C, and drop a vertical D, F.

Suspend from the angle B, A, D, and drop a vertical A, E. Their intersection at the point G is the center of gravity, which is posterior to the intersection of the diagonals.



*A*, *B*, *C*, *D*, trapezoid of the superior dental arch; *G*, center of gravity of figure; *A*, *G*, *E*; *D*, *G*, *F*, gravity lines, their intersections marking *G*.

About the center of gravity the vacuum chamber should be placed, its outline following that of the arch, on a smaller scale. In the vast majority of cases, the center of gravity thus determined will be found at about the height of the vault.

The ends or apex and angles of the chamber should be about equidistant from the center of gravity, as a rule the apex of the chamber as far in front of the intersection of the diagonals as the center of gravity is behind that point.

To apply these facts practically as a guide to finding the correct position of a chamber—Draw first on the plaster model the median line of the vault. From the centers of the cuspidati to the centers of the third molars draw diagonal lines, the diagonals of the trapezoid. When all the teeth are absent, draw from the positions formerly occupied by the cuspidati to the centers of the condyles, the two diagonals.

To find the center of gravity, draw from the centers of both condyles lines to the junction of the first and second bicuspids of the opposite sides, other lines, which intersect at a point of the median line G ; this point will be the center of gravity of the trapezoid and of the palatal vault. The intersection of the diagonals will mark the focus of the small parabolic area to be covered by the chamber-piece. Draw this parabola, its apex, about as far in front of the point of intersection of the diagonals as the center of gravity is behind the latter point, the angle of the parabola, the same distance from the center of gravity as the apex. Should there be a lack of harmony, of bilateral symmetry of the right or left sides of the arch outlines, make the outline of the chamber in correspondence.

FIG. 1.

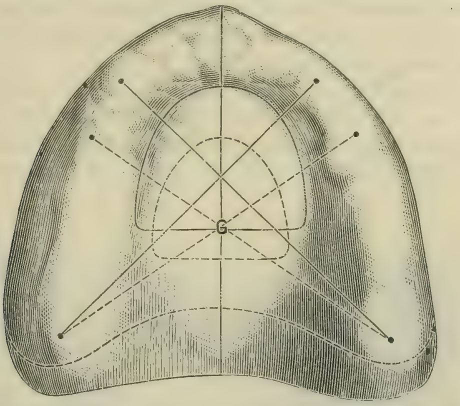


Fig. 1 represents a model, having the outline of an old chamber, too far front; the correct position is marked behind it, also the lines which have determined its position. It may be remarked, parenthetically, that an increased stability was secured by correcting the position of the chamber in this case.

To form the chamber-piece, fold a small strip of paper, and lay the line of fold along the median line of the arch, and on the surface of the paper draw one-half the outline of the chamber area. While folded the paper is cut along this line, unfolded, and is now the pattern for the chamber-piece. If of metal, mark the shape of the paper on the metal and cut out, and fix in position by means of a pin at the apex and at each angle.

If of wax, cut from a sheet of gutta-percha and wax base-plate (which is usually too thin by half for chambers). Make this cut firmly and sharply. Soften the wax slightly, flow over the height of the vault a little melted adhesive wax, and press the wax chamber into position, the outlines of wax and pencil-marks corresponding. A warmed spatula is used to smooth the edges of the chamber, which should be sharp, distinct, and a slight slope given to the walls. Chambers which have not sharp outlines do not afford firm adhesion.

This description may imply a lengthy or somewhat complicated operation for such a matter as making a chamber, but a trial of it will show it to be simplicity itself; and it may be done as expeditiously as with other methods. There is also an increased assurance of accuracy. The method, of course, does not apply to cases in which it is impossible to use a median chamber.

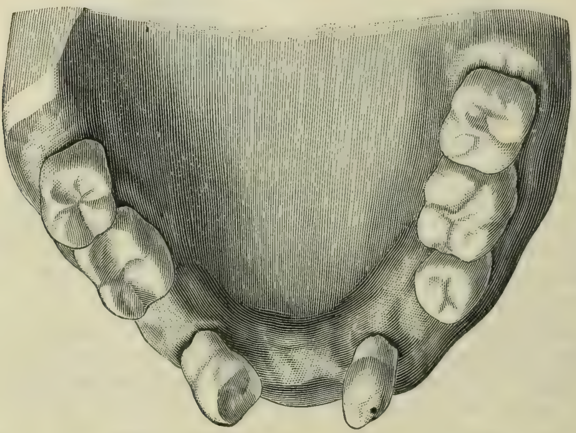
I have followed this little plan for at least ten years, and in that time applied it to thousands of cases, and believe with better results than had hap-hazard placing of a chamber been practiced.

Plates should by all means be made without chambers, if without it they still fulfill all the requirements for a good piece; but my own experience teaches me that this result is the exception, not the rule, and, incidentally, this experience is not an inextensive one.

The following illustrates one of the unusual cases where the operator's better judgment is, owing to the prejudice of a patient, held in subordination. It is one of those instances in which the aversion a person may have to the loss of a natural tooth or teeth will compel the dentist to retain an organ which is manifestly detrimental to the success of an artificial denture.

The natural teeth (Fig. 2) are in such position that the axis of each with the plane of the floor of the mouth is an acute angle. The entire space bounded by the lingual surfaces of the teeth and alveolar ridge, and the floor of the mouth, is roughly a frustum of a cone.

FIG. 2.



Had the incisor and solitary bicuspid been extracted, the operation would have been a comparatively simple one; or had even the left bicuspid been removed, it would have materially lessened the difficulty. The patient insisted upon the retention of both.

The first stage of the operation consists in securing an accurate plaster impression.

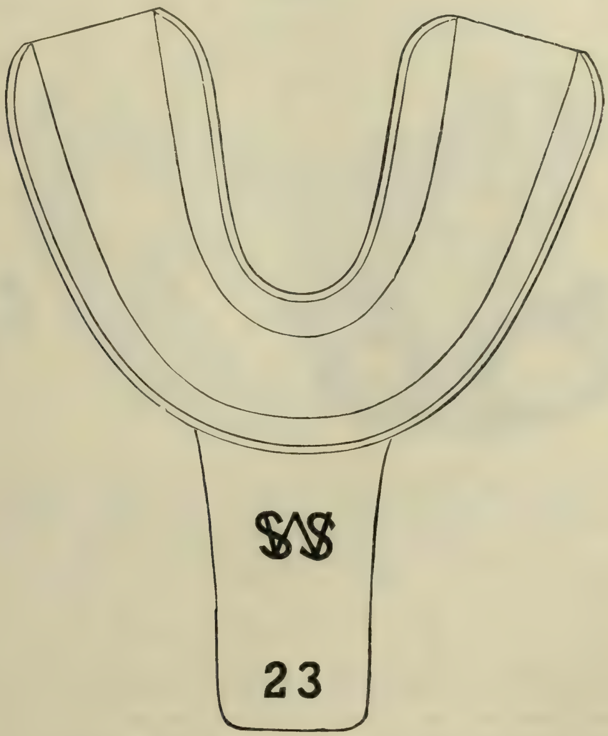
The writer desires to here express a distaste for the method of taking such impressions as consists in first securing a wax impression, carving this out, and using the wax as a cup for taking the plaster impression.

Almost inevitably the heat generated by the setting of the plaster is sufficient to soften the wax; and as such impressions break into many pieces, the matrix to which they are to be returned suffers such change of shape that accurate replacement is impossible.

Better results are had by using such a cup as the No. 23 of the S. S. W. list. (Fig. 3.) It has firm and rigid walls, and bending is not at all probable. Cups made of thin or pliable metal are open to the objection of bending when any marked force is used upon them. The square, smooth cup furnishes a guide in replacing fragments.

The inner surface of the cup is oiled, so that it will separate readily from the impression ; it is filled with pasty plaster inserted in the mouth, and, before pressing it home, is shaken gently so that the batter will insinuate itself into all depressions ; it is then pressed into position and held on both sides until the plaster has set hard. The cup is removed and set aside. A sharp knife-blade is used to groove the plaster over the cutting-edges of the teeth, one finger is inserted under one edge of the plaster and an outer section is removed ; repeat the operation until the outer segment of the impression has been taken away. Then with the tip of the little finger push upon the plaster, in the spaces between the teeth, until all the sections are removed. They are then brushed free from adherent particles and placed in position in the tray, and cemented to the cup by means of adhesive wax.

FIG. 3.



A light coating of shellac is given the impression, and when this has hardened perfectly a thin glaze of sandarac applied.

Long, stout toilet pins are thrust into the impression of each tooth. The impression is dipped in water, and the surplus moisture shaken out. A batter of plaster is made, rather thin ; the pouring of the model is begun at one end of the impression, gently jarring the plaster into place, and displacing the air from depressions ; successive additions of plaster are made until a broad, heavy mass results, which is then inverted on a glass slab. Models for these cases should set for at least twelve hours before an attempt to separate them from the impression is made.

The cup is removed and the plaster shaved from over the teeth until the points of the strengthening pins are exposed.

It is then taken away piecemeal from the sides and between the teeth ; this must be done carefully, to avoid fracture of the plaster teeth. When trimmed, it was found that the ordinary partial lower plate could not be adjusted to such a model, the distance between the edges of the teeth and their bases being so marked that it would be impossible to insert a plate in any other way than from without inward, thus virtually necessitating the plate support proper to be at the labial and buccal aspects of the ridge.

The plaster teeth were sawn half through, then broken off, leaving a sharp line of fracture, and all of them preserved.

Dies were then made ; a brass plate swaged of sufficient size to support the teeth. Openings were made in the plate corresponding with the bases of the incisor and bicuspid.

The plaster teeth were now cemented to place on the model.

FIG. 4.

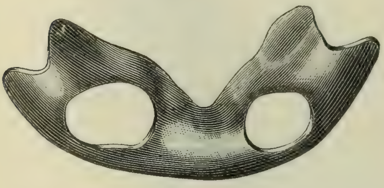


FIG. 5.

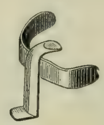
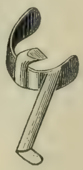


FIG. 6.



The trial plate of brass was tried to the model, and cut away at all points interfering with its placement upon the ridge, and at the completion of this process had acquired the irregular form represented in Fig. 4. A saddle resting upon the alveolar ridge, and having two apertures much enlarged to permit passage over the isolated teeth, at its extremities, dressed away to allow passing over the overhanging edges of left inferior second bicuspid and right inferior second molar.

The plate was reproduced in gold, using two laminæ of No. 29.

This, when placed in the mouth, was found to have a lateral movement upon pressure, due to its lack of contact with the natural teeth.

Ordinary clasps, for such a case, are out of the question, so on the molar and bicuspid partial clasps were made of the pattern suggested by Dr. Bonwill, having in the middle of each an inverted L resting upon the masticating surfaces of the teeth, and protecting against the extremities of the plate burying in the gum. The L's were made of half round platinized gold, the lower end extending to the plate and soldered to it, this extension serving as an elastic supporting-bar (Fig. 5).

The clasp upon the left bicuspid (Fig. 6) was arranged somewhat differently from the molar clasp in that its attachment to the L support was at almost its lingual extremity. This was done to increase the spring-like action of the clasp and enable it to pass easily to position without interfering with the perfection of its grip upon the tooth when the denture was finally in place.

Prior to attaching these clasps, both apertures in the plate were surrounded by a heavy triangular gold wire, to prevent irritation by a thin edge at these places.

FIG. 7.

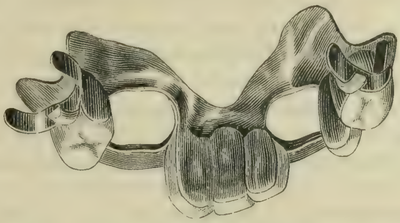
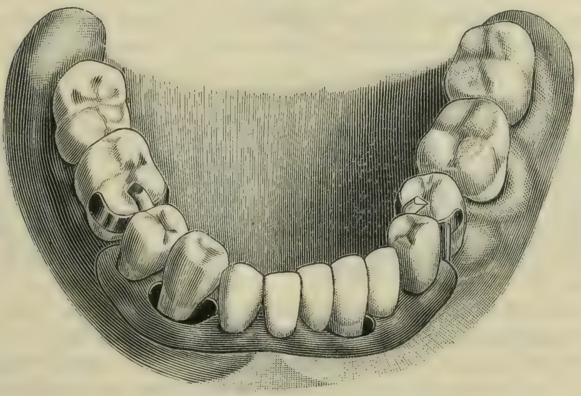


FIG. 8.



Plain teeth were fitted to the plate, backed and soldered, and along the external wall of the plate an artificial gum was made of the mixed rubber known as Walker's granular gum.

Fig. 7 represents the finished piece, and Fig. 8 the same in position upon the model.

## A CASE OF PERSISTENT FACIAL NEURALGIA DUE TO ENAMEL-NODULES.

BY LOUIS OTTOFY, D.D.S., CHICAGO, ILL.

MR. L. E. M., aged 30, an attorney by profession, suffered from intermittent neuralgia for several years. No improvement was noted either under the care of his physician or his dentist. All of the teeth were carefully examined, suspicious fillings removed, and all cavities filled, without any appreciable reduction of the pain. Finally the superior left upper third molar, which had a pin-head filling on the occlusal surface, became sore, and all indications warranted the belief that an alveolar abscess was in the course of formation. The filling was removed, and an attempt made to encroach upon the pulp. During this procedure it became evident that the pulp was still alive. Having encroached upon it, nothing remained to be done but to devitalize it. This was done, the root-canals were cleansed and filled (unsatisfactorily to me); the cavity was filled with a plastic. For a brief period the pain did not seem so intense, nor were the paroxysms as frequent; but within three months there was no perceptible difference between the conditions prior and subsequent to the devitalization of the pulp. The period from the first introduction of the small filling upon the occlusal surface, until the time of the extraction of the tooth, extended from December, 1890, to July, 1892. Upon examining the specimen (Fig. 1) it will be found to contain a large enamel-nodule at the intersection of the irregularly-disposed roots, on the surface which in the mouth corresponded with the mesial.

Within a few months after the removal of this tooth similar symptoms appeared on the right side of the face, which until this time had been perfectly free from pain. But the pain was not so frequent, neither was it as intense as on the left side, and the patient did not feel disposed to have anything done with it except its removal, and that not until it was absolutely necessary. In May, 1895, the pain increased in intensity, and the paroxysms in frequency. The right upper third molar was the one at once suspected, and I suggested an examination of the condition of the roots so far as possible.

FIG. 1.

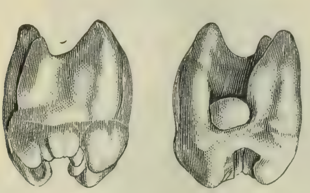
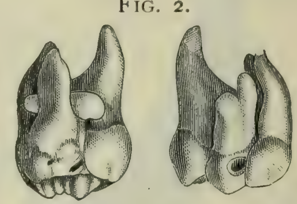


FIG. 2.



The soft tissues were laid open on the distal surface of the tooth, and the wound tightly plugged with cotton and iodoform. After several days of repeated application, a portion of the process was cut away with a bur, and the enamel-nodule, situated on the posterior surface, was noticeable. The tooth was extracted June 8, 1895, and an examination of the specimen (Fig. 2) shows the presence of two nodules; and on that surface which occupied a mesial position in the mouth there is imbedded what seems to be another tooth.

Since the extraction of this tooth, the patient has been perfectly free from pain.

The illustrations show front and rear views of both teeth.

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# THE ANESTHETIC AND ASPHYXIATING EFFECTS OF NITROUS-OXID INHALATION.

BY J. D. THOMAS, D.D.S., PHILADELPHIA, PA.

(Read before the Pennsylvania State Dental Society, July 9, 1895.)

MR. PRESIDENT AND GENTLEMEN: The past year having been the fiftieth anniversary of the discovery of the anesthetic effects of nitrous oxid, by Horace Wells, the subject has received a pretty thorough handling by gentlemen far better equipped for the purpose than your essayist; therefore, it is approached with no little misgiving upon his part. But there is one phase of the subject which even yet is not clearly understood or accepted, and it would seem, while the present interest exists, that it is an auspicious time to endeavor to substantiate the correctness of certain theories of the physiological effects of nitrous-oxid inhalation which the facts seem to warrant, as well as to whom belongs the honor of the great discovery.

There have been two theories advanced by gentlemen well versed in the knowledge of the effects of anesthetics, and each theory is based upon exceedingly plausible reasoning for its acceptance; so that as yet there is no thoroughly established understanding of what should be accepted by unanimous consent as the true explanation of the physiological effects of nitrous oxid.

It will be the object of the present effort to endeavor to establish the fact that nitrous oxid possesses as true and specific anesthetic properties, independent of the apparent asphyxiating accompaniment, as any of the anesthetic agents now known.

You all know that the two theories alluded to (both of which have many indorsers) are, first, that nitrous oxid produces its peculiar effects by deoxidation of the blood, or by true asphyxia from the want of oxygen; and second, that the anesthetic effects of nitrous oxid are due to an inherent property of the gas, which is distinct from and independent of the asphyxial concomitant frequently observed in connection with its administration.

In the DENTAL COSMOS for May, 1893, Dr. H. C. Wood—than whom I know of no one better qualified to speak as a scientific authority—gave the results of a series of experiments upon dogs, by first administering pure nitrous oxid to the obliteration of the corneal reflex. Then the same with three per cent. and five per cent. of oxygen, and finally inducing mechanical asphyxia by means of complete stoppage of the oxygen supply. The results of these experiments with the different percentages of oxygen mixture show a variation in time required to produce insensibility to the corneal reflex from two minutes and fifty seconds to twenty-three minutes; but those with pure nitrous oxid and mechanical asphyxia varied from one minute and forty-five seconds to three minutes and twenty-seven seconds for nitrous oxid, and one minute and forty seconds to two minutes and thirty seconds for asphyxia. The close approximation in time between the latter two led Dr. Wood to the conclusion that the theory of deoxidation was the correct one; yet in nearly the same breath he admits being surprised at realizing the powerful effect upon himself of nitrous oxid with five per cent. of oxygen, after only two or three deep inhalations,—to which had he given due consideration, he would at least have been led to question whether asphyxia was the only effect produced by nitrous oxid.

More recently, Dr. W. W. Belcher—in a paper read before a Union Meeting of the Fifth, Sixth, Seventh, and Eighth District Societies of New York, at Buffalo, on October 13, 1894—gives the results of his personal experience in some interesting experiments of respiring nitrous oxid pure, and then by rebreathing air to the exhaustion of its oxygen; and he reports a striking similarity in the effects and sensations of each, which leads him to the conclusion again that the gas is asphyxiating and should be used with caution, but, carefully administered, it is the safest and most agreeable agent in use for producing unconsciousness,—and yet, if its effects are produced by asphyxia alone, why should it be any safer or more agreeable than numbers of other agents which we know will produce unconsciousness from the same cause?

It seems to me that the phenomena which distinguish true anesthesia from asphyxia have not received full consideration, and that their distinctive features and effects are not well understood.

Anesthesia is usually regarded as a condition of artificial sleep; but there may be several ways of producing artificial sleep or unconsciousness, which would not be a state of anesthesia.

From an experience of considerably more than one hundred thousand personal administrations, there is recognized convincing proof that a subject in a state of anesthesia is physiologically in precisely the same state or condition as one in a like degree of intoxication from the effects of the different forms of alcohol, only one is produced by inhalation and the other by alimentation; you have first stimulation and exhilaration, followed by intoxication, unconsciousness, and, finally, if pushed to that extent, death as a result. The effects are produced and exhibited in process,—first, by sensory paralysis, beginning at the periphery; simultaneously the cerebrum is affected, but loss of upper function or consciousness does not take place until a considerable peripheral anesthesia has been produced. The motor nerves may yet retain their power, without the guidance of volition. Then the motor nerves, and finally the medulla, succumb, when respiration and cardiac force cease. The order of the progressive effects is precisely the same in each.

We have from the different forms of opium poisons, effects exhibited in stupor and unconsciousness, and, finally, death; but no stimulation or intoxication. Similarly, we have like effects produced by the inhalation of poisonous gases, such as the fumes of sulfurous acid, mephitic gases, and carbonic acid gas. These are narcotic poisons producing their similar effects, one by alimentation, the other by inhalation,—the latter carrying with them a degree of asphyxia; but the final results cannot be ascribed alone to the want of oxidation.

Asphyxia produced by the inert gases, nitrogen or hydrogen, or by mechanical obstruction of the air-passages, results in unconsciousness, violent respiratory effort, stertor, muscular twitching, and sometimes convulsions, with death as a final result from lack of oxidation in the circulation. Recovery from the unconscious period being attended by extreme lassitude, and perhaps complete prostration.

While it is true that the asphyxial concomitant is a feature of profound nitrous-oxid narcosis,—perhaps also of all anesthetic agents,—and it is likewise true that anesthesia is a concomitant of the asphyxial state, it must be borne in mind that the order of appearance of anesthesia and asphyxial symptoms in the two states noted is widely different. As I have before stated, peripheral anesthesia is one of the earliest phenomena observed in nitrous-oxid inhalation, while in true asphyxia anesthesia is not produced until deoxidation of the blood has proceeded to a point of positive danger.

That nitrous oxid is an inert gas so far as its power to support life is concerned, is accepted to-day as a truth, there being no separation of the oxygen from the nitrogen at the temperature of the human body ; so that it need cause no wonderment that many accept the theory of its producing its effects by the want of oxidation, for the breathing of pure nitrous oxid unmixed with oxygen or atmospheric air will in some cases produce all the symptoms of asphyxia, such as stertor, constriction of the glottis, muscular twitching, and even convulsions ; but here the similarity ceases, for the effects pass away in a phenomenally short space of time, leaving the patient with no perceptible after-effects of lassitude and prostration, except in very rare instances.

The length of time shown by Dr. Wood's experiments with asphyxia upon dogs, ranged from one minute and forty seconds to two minutes and fifteen seconds to produce annihilation of the corneal reflex. How long it may require to produce the same effect in man is of course problematical, but in a former paper upon the subject I recorded that a man exhibiting at the Walnut Street Theater under the pseudonym of "The Man Fish," performed several feats such as eating and smoking under water in a glass tank for the duration of three minutes and nine seconds, without showing any of the recognized symptoms of asphyxia other than considerable pallor of countenance and blueness of lips.

I have recently taken a record in one hundred cases of the time required in my own practice to induce anesthesia, in which there was a judicious admission of air during the inhalation, and they were brought to the operating point of unconsciousness in from thirty-two to fifty-nine seconds. It is possible that, by the inhalation of an inert gas, the displacement of the oxygen in the lungs might produce unconsciousness in less time than by the voluntary suspension of breathing of this "man fish ;" but comparing his time of three minutes and nine seconds and the one minute and forty seconds of Dr. Wood's experiment upon dogs for asphyxia, and the time—less than one minute—required by the inhalation of the gas in private practice, certainly shows that there were other influences at work than simply deprivation of oxygen ; and it is just this lack of practical information which has led to the confusion in the theories alluded to. It is clearly shown that the gas possesses true anesthetic properties, by its exhibition of exhilaration, intoxication, and unconsciousness ; and it is equally true that it will cause symptoms of asphyxia, as shown by cyanotic appearance, stertor, muscular twitching, etc. ; but the essential difference in the two states is evinced by the fact that the narcosis of nitrous oxid is capable of extension to the point of surgical anesthesia before asphyxial symptoms supervene ; the period of inhalation being so short that the risk of injury from asphyxia is so infinitesimally small that it is hardly worth considering. This is shown by the fact that in this country alone, it is computed that at least nine or ten millions of people have inhaled the gas for oral and minor surgery at the hands of men of all grades of ability, with but three or four deaths resulting therefrom. That the gas is a thorough anesthetic independent of the asphyxial accompaniment, is still further proven that by a mixture of oxygen anesthesia can be perfectly produced with little or none of the symptoms of asphyxia so prevalent when the pure gas is given. So thoroughly are they imbued with this idea in Europe that they use it altogether, Dr. Hewitt going so far as to state that in his opinion "the administration of nitrous oxid free from oxygen is irrational and unscientific." He does not say that oxygen will in all cases prevent a small degree of cyanotic appearance, but that the condition is such that even a member of the patient's family could witness the exhibition without becoming in the least alarmed, and that the anesthesia produced is if anything more profound than with nitrous oxid alone.

The same results are obtained by the admission of a proper amount of air during the inhalation. Blueness is in many cases scarcely apparent, while stertor, muscular twitching, and pharyngeal constriction are entirely obviated. Then too, as further illustrating the fact that asphyxia is not the anesthetizing force of the gas, two or three breaths of air, after the discontinuance of the gas, will restore absolutely the natural color of the blood ; yet notwithstanding this obliteration of asphyxial symptoms we still have an operating unconsciousness sufficiently prolonged for twenty to thirty seconds, showing conclusively the true anesthetic properties of the gas, and that the cyanotic appearance is only an accompaniment, the injurious effects of which are infinitesimal, and can be kept in complete subjection by combining oxygen or admitting atmospheric air. The latter method has its advantages over the oxygen, in that we can control each individual case by the proper admission of air, as occasion requires, thereby producing greater uniformity, while with the admixture of oxygen in bulk, the variation in time with the different degree of constitutional strength of the subject is sometimes annoying, and when applied by the duplex inhaler the frequent changes and manipulation of the oxygen supply are not reassuring to the patient. Again, comparing the similarity of effects of alcohol intoxication and anesthesia, we find many constitutions able to withstand the effects of an inordinate amount of whiskey, while others are easily affected thereby ; the one being nearly impervious to the diluted article, the other incapable of resistance. The same powers of resistance are presented with the gas, or any anesthetic. This explains why the admixture of oxygen in bulk would vary so much in different individuals. By using the nostrils as a valve and having the lips as a guide, the degree of cyanosis can be controlled, the stertor and muscular twitching excluded, and complete anesthesia produced ; the small degree of blueness being no disadvantage, and in the ordinary course of daily practice doing no harm. The fact of there having occurred three or four fatal cases admonishes us that there is a very small degree of danger attending, but unfortunately these were cases where conditions were not taken sufficiently into consideration, and where the possibilities of risk were not clearly recognized. The dangers are clearly from the production of asphyxia.

The cases requiring caution are the very anemic, the very full-blooded, the slow breather, and persons of low vital force from grippe or overwork. In the anemic, the paucity of red corpuscles is so great that the least deprivation of oxygen is felt in the heart's action, which may be depressed almost to the point of syncope at the expiration of the second breath. In such a case, in the event of death, it would be from almost instant heart-failure, and the post-mortem would not show the effects of asphyxia in great discoloration of the blood and tissues, for the circulation would have ceased before such a condition could have been brought about, yet death would be legitimately from the want of oxidation. In the full-blooded, stertor and constriction of the glottis take place rapidly, and the difficulty of getting a sufficient amount of air in the lungs in time to reoxidize the blood might result in cessation of respiration, and finally death from asphyxia. A case of this kind would be more accidental than from the physiological effects, for if the tongue is pulled forward to open the air-passages before the respiratory effort ceases, recovery is certain. In the slow breather, danger of suspension of breathing is as great as heart-failure in the anemic. In the experience of your essayist there are just as many people in apparent good health with weak respiration as there are with weak heart-force ; people who seem never to take a breath except with voluntary effort, and then not more than twelve or fourteen to the minute. The color of the lips would indicate that their blood is never fully supplied with oxygen, and they require the full amount of their capacity to keep them going, the same as the anemic do for their heart-action. In either case they are intolerant of an insufficient supply, so that suspension may occur early in the administration, the heart's action continuing from ten to fifteen minutes after. In the event of death in such a case, the post-mortem would undoubtedly show the results of asphyxia in the discolored blood and tissues. These cases have had much to do with the acceptance of the theory of asphyxia being the only effect of nitrous-oxid inhalation.

In the cases of low vitality, the dangers are less, but the results might be from prostration, the nervous system being too weak to throw off or rally from the effects of the anesthesia, independently of any depressing effect of the small degree of the accompanying asphyxia. Such a case is reported at the meeting in Buffalo ; the lady a professional nurse, who, like many of her profession, presented appearances of overwork, to which was added severe suffering from neuralgia, for which a resection of the inferior dental nerve had been advised after some months of suffering, loss of strength and health. In the mean time, the cause of her trouble was located in a third molar. On the day of the extraction, she had taken three-quarters of a grain of morphia ; complete prostration followed the operation, the respiratory effort entirely suspended, pulse hardly perceptible, and had it not been for the continued use of the Fell apparatus for artificial respiration, the patient would no doubt have died. Cases where such results might be looked for were quite numerous during the grippe epidemic of 1891 and 1892, but whether from grippe or other enervating conditions, the results might be the same. In my own practice, two cases in this condition were advised against taking the gas ; one died within twenty-four hours, and the other three days after leaving my office. Had I given the gas, even had they recovered at the time, death would no doubt have been ascribed to the effects of the gas.

Attention is called to these cases to illustrate the fact that some knowledge of conditions must be had, so that we can use discretion and avoid the dangerous results, by first recognizing the subjects which are likely to be so affected, and second by recognizing the symptoms of danger as they approach.

From the foregoing and from practical experience, it would appear to point to the conclusion that the inhalation of nitrous oxid does produce perfectly legitimate anesthetic effects as exhibited by stimulation, intoxication, and unconsciousness, and, there being no separation of the oxygen from the nitrogen at the temperature of the human body, it is practically an inert gas so far as oxygenating the blood is concerned, which will, when its administration is pushed far enough, develop the asphyxial condition, the evil effects of which can be rendered practically *nil* by the proper combination of oxygen or air. Inasmuch as the condition of true surgical anesthesia precedes that of asphyxia, the latter should never be produced ; and when it is, can only be attributed to a lack of intelligent understanding of the physiological action of the gas.

# PROCEEDINGS OF SOCIETIES.

## TRI-STATE DENTAL MEETING.

(Continued from page 859.)

### SECOND DAY—*Morning Session* (Continued).

DR. W. H. WHITSLAR, Cleveland, read a paper, of which we give the following abstract, entitled,—

### GENERATION AND DEGENERATION OF THE TISSUES OF THE MOUTH.

The first general observation we should perceive in the study of vital phenomena, is the mutual dependence of all things, which in their groupings together compose the system of nature. This dependence requires for each being, the existence of all the others.

Man's life is inseparably linked with the plants and animals, and his existence depends upon the climate and productions of the earth. Every animal arises from an egg,—*i.e.*, an impregnated cell from the female. The union of this protoplasmic material involves chemical and physical phenomena, and, endowed with united vital forces, organization is promoted. These chemical changes increase in proportion to the growth. Indeed, the cell is the simplest physiological apparatus, and as such is the seat of chemical processes. It is generally conceded that all chemical changes of importance do not take place in the animal fluids, but that these occur in the cells. The cells regulate by their activities the chemical processes and exchange of foods.

In the generating of the tissues of the mouth from the primitive cell, the process of segmentation evolves the ectoderm and entoderm, from which springs the mesoderm. Just why these layers of cells, which are seemingly evolved from the same material, should mature different tissues is difficult to understand. All we can say is that there is a different chemical and physical arrangement of the molecules of matter, presided over by existing vital forces.

That vital phenomena have to do with the chemical arrangement of bodies, is exemplified by the experiments of Mr. Rainey in the processes of calcification. In the formation of enamel or dentine, calcific material is held in chemical combination with the intercellular substances in the vicinity of, and in, the enamel-organ and dentinal papilla. By the action of ameloblasts and odontoblasts—specialized cells—enamel and dentine are formed. It is by their activities that the lime is deposited chemically as well as physically.

An aggregation of cells composes what is termed the enamel-organ, and it is said that the function of the enamel-organ is the formation of enamel. Strictly speaking, however, it is a matrix to mold the form of the tooth, the performance of function being resident in the ameloblasts.

Function is a vital phenomenon; and pathologic conditions are perverted physiological phenomena. The difference between these two conditions is an indefinite line wherein the balance of vitality is overcome by perverted function. If tissues are degenerated from their normal tendencies, regeneration balances the waste, but if they are normal it is a physiological process. If, however, the cell-destruction is greater than the cell-production, regeneration is suspended and atrophy results. Thus we observe that the degree of atrophy is proportionate to the diminution of function.

Now, we find frequently that teeth have white and brown spots that are congenital. These spots are the result of perverted function of the cells that superintend the deposition of the lime-salts. This perversion is ostensibly caused by starvation or improper metabolism of foods. It would not be entirely amiss to surmise that the white spots were produced by increased function, but limited in the supply of organic materials. In these, we find the intermediary organic substance is deficient. The colored spots contain a greater amount of organic matter than the white spots. This may be due to the sluggishness of circulating fluids in the vicinage, resulting in stagnation or lessening of the chemical and physical processes. Thus, while other parts of the tooth are developing, an area of imperfect tooth-material is constructed, which is due to the lack of power of the cells which have to do with the building, so to speak. There is a failure of correlation of the organic and inorganic substances, and the tooth becomes more of an admixture than a proper organization.

Notwithstanding criticisms to the contrary, I believe that hemoglobin and oxyhemoglobin of the blood and their derivatives, hemochromogen, hematin, and methemoglobin, acting as transudation products, or even the results of decompositions, stain these areas by being incorporated with the material.

It is to be remembered that the blood-vessels are in close proximity to the ameloblasts, also that these cells are derived from the Malpighian layer of cells, which have to do with the pigmentation of the mucous membrane. There is in this a close analogy which may be significant. However, we must rely upon the activities of the blood in the vicinity, for it is the first tissue to exhibit extreme atrophic changes.

It is necessary to have blood present after the first stages of calcification to further that process. During these preliminary stages the mineral elements may be found in proximity to the developing tooth, and from these the primary deposits may be accrued.

The mineral substances are the most essential constituents of the teeth. Phosphate of lime is greater in amount in the teeth than in any other tissue. The consumption of it during pregnancy is often so great that it does not appear in the usual amounts in the excreta, scarcely any trace being found. (Lehman.) This may account in part for Lehman's declaration that lime-salts are deposited mechanically in bones. He gives as proof, the ease with which lime-salts can be so thoroughly dissolved from bones by hydrochloric acid. Acting upon this hypothesis, may we ask the question, "Are enamel and dentine deposited mechanically?" This is partially true, I believe, for, as already stated, there is resident material in the part, as well as that which is carried to it by blood and intercellular fluids. This may be a process of osmosis, or it may be one of catalysis. We learn that "earthy phosphates are found in all cells and tissues. Indeed, they seem to be of greatest importance for the life of the cells and the chemical processes that accompany their evolution; that it is impossible to separate them from the protein substances without decomposition. There is no animal tissue which does not contain mineral substances." "The bones, teeth, and muscles, contain the most minerals." "In the distribution of mineral substances we find them dissolved in the fluids and partly combined with organic substances."

The question naturally arises, Are mineral substances manufactured within the body? It is established that on the burning of the organic substances the mineral bodies are liberated and eliminated. They, in part, combine with new products of the oxidation and become attached to the organic bodies which are free from salts, and are absorbed from the intestinal canal.

Hence, it would be seen that a constant supply of mineral substances is not absolutely necessary, and that an insignificant amount of inorganic bodies must be administered. So I wish to argue that, for this scientific reason alone, it is not a necessity to administer constantly, foods bearing large quantities of phosphatic materials to develop good teeth. We must rely upon the resiliency of life as the energizing power to create metabolism. Physical forces strive to maintain themselves in equilibrium—thus we have metabolic power. A point of rest, normal state of being, is attained because physical forces act upon matter even if it has attained its equilibrium. Inorganic chemistry also induces motion, and continues active in motion and metamorphoses until the closest affinities are satisfied. Albinus established the axiom that the essence of vital force consisted in motion. But if that vital power is by disease deficient, then the metabolism of materials into tooth-structure is obstructed, and we see the results in deformed teeth, both as to form and structure.

Rachitis and concomitant diseases, affecting particularly the bony structures, are resultant from imperfect metabolism and starvation. The mineral substances leave the body uninterruptedly in starvation until death. (Hammarsten.) The experiments of Chossat and Voit show the loss of weight of bones during starvation to be as high as seventeen per cent. in pigeons, and fourteen per cent. in cats. Blood and its solid ingredients decrease in proportion to the weight of the body. Naturally, then, the teeth, whose development is dependent upon blood, must suffer.

It is not necessarily sufficient to argue that the teeth suffer in the same proportion as bones, because one system of organs may derive its nutriment at the expense of another organ, so it is impossible to say that teeth receive their aid from this or that. They do suffer, however, and all the permanent teeth developing whilst in utero show at times marked signs of starvation. The cells, which are the constructive agents of the teeth, may have such environments that the resiliency of their activity is sufficient to controvert the disease; their chemical and physical activities are alert, and extract from other tissues material for a continuance of construction. This seems to be a gift of specialized cells.

Phosphate of lime is an important adjunct in metamorphosis of animal tissues. We receive much of it through our food. The graminivorous animal receives it through the vegetable kingdom in certain nitrogenous bodies which contain phosphate of lime, as in vegetable albumin, legumin, and glutin. Phosphate of lime is not removed from the body until it is partially decomposed or oxidized, and in this process phosphoric acid must accrue, which enters into union with the lime that enters the body with cereals and leguminous plants. Hence, we observe the relation of our bodies to all that surrounds us, as stated in the beginning of this paper. Our body is a great chemical laboratory, in which wonderful phenomena are exhibited.

Developing tissues of the mouth have great reliance upon chemism, and improper construction may be due to the disassociation of molecules of matter, all these being modified by the principle of life.

### *Afternoon Session.*

Wednesday afternoon was devoted to operative clinics. These were numerous, and fully as interesting as those of the day before. Drs. N. S. Hoff, of Ann Arbor, and N. W. Hiett, of Marion, Ind., extracted a number of teeth, using local anesthetics to obtund the pain.

Dr. N. S. Hoff, Ann Arbor, Mich., read the following paper:

## A Study in Dental Anesthesia.

### *Nitrous Oxid.*

The comparative safety of $N_2O$ as a general anesthetic has made it deservedly the most popular for all brief surgical operations, especially in dental practice. Its administration is, however, attended with so many objectionable symptoms that many good operators are unwilling to make use of it. The principal objection is its tendency to produce symptoms similar to asphyxia, if not identical, and consequent dangerous results. The most successful efforts to overcome this tendency have been those where oxygen has been combined with the $N_2O$ in some form as a corrective.

Dr. Frederic Hewitt, of the London (England) Hospital, has made a considerable study of this subject, and has devised a simple apparatus for the proper mixing and administration of these agents; and in vol. xxxv, page 724 and seq. of the *British Journal of Dental Science*, he details an experience with it in some eight hundred cases.

The characteristic symptoms of $N_2O$ when administered, are a kind of guttural, jerky, and spasmodic breathing, due to spasmodic movements of the larynx; an excited and somewhat vacillating pulse; muscular clonic spasms, especially in children and debilitated patients; intense cyanosis, swollen and congested tongue and mucous membrane, and dilated pupil.

It is Dr. Hewitt's claim that these manifestations can be entirely overcome by the administration of a small percentage of oxygen with the $N_2O$, and also by a proper admission of air they can, to a certain extent, be prevented. But the air is objectionable because of the large percentage of nitrogen it contains, which has no particular anesthetic or corrective power, and is detrimental, as it so dilutes the gas as to prevent prompt anesthesia and to produce intoxication rather than anesthesia.

The advantages of nitrous oxid and oxygen lie in the fact that the asphyxiating symptoms are delayed or prevented and a larger quantity of nitrous oxid is presented to the sensory tissues, and consequently more profound anesthesia results. More time is required for effects, but a somewhat relative lengthening of the period of insensibility follows.

I have no time to review in this abbreviated paper the experiments of Professor Paul Bert, who succeeded in maintaining complete anesthesia for twenty-six minutes with a mixture of $N_2O+O$, with no unpleasant symptoms of any sort, by administering the mixture under a pressure of one and one-half atmospheres. Nor of Professor Hillischer, of Vienna, who obtained complete anesthesia for a shorter period with a similar mixture without the addition of atmospheric pressure. These experiments stimulated Professor Hewitt to investigate the subject, and in a long series of experiments in over eight hundred cases he came to the conclusion that it was a practicable idea, and has invented a suitable appliance for the proper mixing and administration of these combined gases. He found by experiment that from ten to twelve per cent. mixture of O with $N_2O$ answered general purposes, but that individuals required modification of the formula, and that an apparatus capable of ready and quick adjustment was necessary to meet various symptoms as they arose, and that no diagnosis was possible by which the best proportions of the gases could be prepared in advance, but the oxygen supply must be brought on as needed. This he claims to have effectively accomplished in his apparatus, which consists of a double flexible tube leading from the nitrous oxid and oxygen cylinders to a double gas-bag, to which the mouth-piece or inhaling and mixing apparatus is attached. This is a metal chamber supplied with the usual soft-rubber hood and inhaling and exhaling flap-valves, and arrangement for regulating the quantity of oxygen admitted to the mixing chamber, which can be rather accurately gauged by means of an indicator and dial on the outside of the metal mixing chamber. It is of great importance that the gas-bags be equally extended, in order that the mixing be accomplished readily and equally. The pressure of the gas in each bag should be as nearly equal as possible, and for this purpose the bags are united, or a single bag is divided by a rubber partition to get the benefit of the elasticity of the rubber sides.

In using this mixture and apparatus in sixty-seven tabulated administrations, it was found that anesthesia was brought on in sixty-six seconds as the shortest and one hundred and eighty-six seconds as the longest period; and the shortest duration of complete anesthesia was forty-four seconds, and the longest eighty seconds. It is observed that recovery is not so prompt as with $N_2O$ alone.

The quantity of O will vary with different persons, and must be controlled by the administrator. It is best to begin with a small percentage, and gradually increase it as indications demand. Excitement stage is shorter with a smaller per cent. of O. The face-piece must fit accurately to exclude all air. Silence and absence of contact with the patient are essential to quiet and successful results without excitement or violence. The margin between the peaceful anesthesia of the mixture and the usual manifestations of nitrous oxid is so narrow that the patient must be closely watched. More oxygen should be given to debilitated or weak persons than to strong-minded, stubborn, or vigorous ones.

The conjunctival reflex is the best indication of complete anesthesia, but snoring and relaxation are also useful indications. The first application of the forceps will sometimes get a slight reflex response, but not sufficient to require any further anesthetic.

Patients do not have the horrible dreams nor scream under the mixture as they do with nitrous oxid alone. They also feel better on recovering, and present a better appearance. The tongue and mucous membrane are not congested or swollen. The mixture acts well in cases of weak circulation, as the pulse is stronger and steadier without the usual primary excitement of nitrous oxid, and none of its after depressing effects.

The unfavorable action of the mixture causes considerable prostration, due to the longer and more complete anesthesia,—a feeling of nausea and sometimes vomiting. More time must be given to recovery. More skill is required to administer it, and strict attention to the manifestations and prompt application of remedial measures. More time is consumed in the operation.

It is recommended for use in children, anemic and debilitated patients, persons easily anesthetized by nitrous oxid.

Persons who do not take nitrous oxid kindly : old people, persons with diseased circulatory organs.

As some points for further study and investigation in this connection, I would suggest the following :

1. The use of gasometers, to obtain required and uniform pressure, and the amount of pressure necessary to secure the best mixing or diffusion of the gases in definite proportions.

2. The extent to which this mixture may be used without injurious results, such as the paralysis of the vital nerve-centers experienced with other anesthetics.

3. A qualitative analysis of the blood under complete anesthesia with the mixture, with special reference to its oxygen.

4. A careful experimentation as to the ultimate physiological effect upon the sensory tissues. See COSMOS, May, 1893, article by Professor H. C. Wood ; and COSMOS, December, 1894, article by E. C. Kirk.

### *Cocain.*

In my early experience with cocain as a dental anesthetic, I, like every one else, encountered difficulties, or embarrassing situations, to say the least, which tempted me to forego the use of this valuable drug as a practicable local anesthetic. And yet its satisfactory obtundent qualities left no choice but to make use of it, although such use seemed to be attended with a considerable measure of hazard.

Like many others who have tasted of its beneficial action, I began experimenting with the drug to make combinations which would render its use more practicable and safe. I began with a six per cent. solution for hypodermic use, and on the basis that one grain could be safely used as a dose. I was not long in discovering that either the dose or concentration was entirely too high, and as I now know, both were. I experimented with various solutions, and finally came to the conclusion that for hypodermic injections a two per cent. solution in water was sufficiently concentrated for any purpose, even for use in anesthetizing pulps ; and in the majority of cases where it can be used, a one per cent. solution would accomplish definite and satisfactory results. I have even secured very satisfactory anesthesia for extracting a tooth with a solution of the strength of one-fifth of one per cent. The dose of cocain I have gradually reduced from one grain hypodermically to one-sixteenth to one-half grain.

It is well known to all that the great objection to cocain lies in its tendency to induce hysteria, when given in small doses, due to its stimulant effect upon the nervous system ; and secondly, its depressing action upon the respiration and heart when used in excessive doses. The tendency to hysteria and respiratory difficulties are the most important complications to consider, for the reason that they occur when least expected and sometimes with small doses, while the heart-depressing effects only occur in peculiarly weak conditions of this organ, or as secondary to the respiratory difficulties or because of excessive dosage.

My first experiments to control this nervous excitement were with the standard narcotics, morphin and chloral. I soon found that many persons were highly susceptible to the use of morphin, and that chloral was objectionable because of its bulk and its excessive irritating character when injected into the soft tissues, causing sloughing of the tissues. The experiments of Dr. Pruyn convinced me that morphin was the most accessible drug to control this excitement effect, and, on looking it up, I found that atropin was morphin's great antagonist, especially against its poisonous and nauseating effects. I therefore began using a combination of cocain, morphin, and atropin, and soon found that I had a satisfactorily corrected formula, and that the drugs seemed to harmonize therapeutically in producing a more powerful local anesthesia, and that systemic disturbances were very rare with proper doses. This combination I am now using as a local obtundent with good results. I use sterilized water to make the solution, and, to prevent possible decomposition, make the solution fresh daily or as needed for use. The formula I use is as follows :

℞—Cocain, gr. ½ ;
Sulphate of morphin, gr. ⅛ ;
Sulphate of atropin, gr. $\frac{1}{200}$ ;
Sterilized water, gtt. xxx.
Mix, and inject hypoder. gtt. v to xv.

For convenience I have had the cocain, morphin, and atropin made into soluble tablets by Parke, Davis & Co., of Detroit, and in this way solutions of the strength desired may be quickly and accurately made with little or no inconvenience. The sterilized water I use is distilled water containing from eight to ten per cent. of listerine or euthymol to keep it sterile. If you desire to make a two per cent.

solution, all that is necessary is to dissolve one of the tablets in twenty-five minims of water. A one per cent. solution can be made by dissolving one tablet in twice this quantity of water, or fifty minims. A four per cent. solution can be made either by reducing the water one-half, or adding another tablet to the twenty-five minims, etc.

The advantage of this method of making solutions is that you can always have pure, clean solutions, and the preparations are portable in small compass. The drugs used in the tablets are the purest that can be had, and the firm assure me they are especially careful in filling all such orders. Another advantage is that other correctives or adjuvants may be added to this formula when the solutions are made.

In my opinion, the manner of using cocain in dental practice has much to do with the disrepute into which this most valuable drug has fallen. It is an excessively poisonous substance, and must be used with the greatest caution and care. There is a tolerably well-marked-out line beyond which clinical experience has demonstrated one cannot go without hazard. Not more than one-half grain, nor in stronger than two per cent. solution, should ever be used at one sitting as a hypodermic injection. It should be used with a clean syringe in perfect order, and injected only a little faster than the tissue will absorb it. Excessive pressure on the syringe will cause irritant results, and introduce more of the drug than is necessary to produce desired effects. All excess or overflow should be prevented or absorbed before it comes into contact with the tongue, as it will be quickly absorbed by the tongue, or if swallowed produce paralysis of the pharyngeal and laryngeal muscles and induce dyspnea and develop hysterical symptoms. The best systemic fortifier is coffee or food.

The pharmacology of cocain has received much attention, and is pretty well worked out. But it still remains for us to make it a practicable and serviceable remedy. From my personal experience with it I am convinced it is one of the most valuable therapeutic agents, and should be in the armamentarium of every dental practitioner, and further study is needed to place it in such form that intelligent and progressive men will avail themselves of its many virtues for their own and their patients' benefit. This study, it seems to me, ought to be along the line of safe non-secret formulæ.

Dr. Hiett announced the formula he was using, to be as follows :

℞—Cocain hydrochlorate, gr. ix ;
Spirit of glonoin, ʒj ;
Carbolic acid, gr. ij ;
Oil of rose, q. s. to flavor ;
Distilled water ad ℥j.—M.

From five to twelve minims to be injected about the root of the tooth to be extracted.

### *Evening Session.*

Dr. C. S. Case, Chicago, read a paper entitled "The Esthetic Correction of Facial Contours in the Practice of Dental Orthopedia," which is printed in full at page 905 of the current number.

### *Discussion.*

Dr. George H. Cushing, Chicago. I am not aware that there can be much discussion upon a paper of this character. I do not know that there are any technical objections to the position that the paper assumes, as to the possibility of moving the teeth *en phalanx* bodily, the sockets as well as the teeth. If there are any such objections, they must fall before the positive evidence of clinical observation.

I think the paper shows conclusively that, as Dr. Farrar remarked, "this demonstrates an era of advance in orthopedic surgery." I think we are most indebted to Dr. Case for an intelligent study of the mechanical principles which govern the movements of the teeth by applied force, in connection with the fact which he has demonstrated, of the possibility of moving the teeth and the processes together. You have seen what he has accomplished, and these models and drawings speak more eloquently than any language can express.

Two of these cases I have seen under treatment from the first. I cannot begin to tell you the extent of the improvement in the facial expression of No. 4. The maxillary bone and the process were so receded that there were depressions each side of the median line so deep that you could lay your finger in them. Those are now very nearly two-thirds obliterated, I should think, and though this mask shows a wonderful improvement, it does not show fully the great change which has been effected, although, as he told you, that was one of the cases so difficult to manage because of the rapid absorption of the process from the pressure of the roots. I think he hopes in time to entirely obliterate the deep depressions under the alæ of the nose. From my observation, so far as the case has progressed, I have no doubt that he will succeed.

Of the other case, No. 9, I may say that these casts especially do not begin to show the improvement that has taken place in the short time in which the patient has been under treatment. The boy presented a very disagreeable aspect, as you see here. There is one feature of the case which the author of the paper did not refer to; it is a feature which is very striking. The boy had the habit of dropping his mouth open continually. He does not do this at all now. I do not know why the movement of these teeth and the contouring of the face by this application of force should have produced that change, but it is a fact that it has. The boy now keeps his mouth closed as other people do. With his chin apparently protruding, owing to the lack of development of the superior maxilla, and the mouth open all the while, you may imagine how very unpleasantly he must have presented himself to his friends. He is now a pretty respectable looking boy, and he was very far from that when he first went into Dr. Case's hands. His family are exceedingly delighted, as they may well be.

Dr. James G. Reid, Chicago. I suppose a few of you will go home imbued with the idea of being able to accomplish what has been shown here to-night by Dr. Case—who is master of the situation; attained only by years of experience and a close study of the physical forces employed and their application, how to direct those forces to the moving of teeth bodily in their sockets. Dr. Case will sit down and figure out on paper, by geometrical and mathematical processes, the direction and magnitude of force at the different points of a regulating appliance and the probable influence it will exactly exert. When you understand that, you will appreciate the success of which he has shown you evidence by these models. It looks easy, when you hear him explain it, but if you attempt it you will be deceived, if you suppose it to be easy. I have seen many of these cases from time to time every few days. Possibly you may feel inclined to doubt some of the results, but I say, as Dr. Cushing has said, that these models do not begin to show you the improvement, and in order to appreciate it you should see the individuals themselves.

Dr. LOUIS OTTOFY, Chicago. The first thing which arrested my attention in listening to the excellent paper of Dr. Case was the introduction of the word Orthopedia into our dental nomenclature. I presume that when Dr. Case commenced the practice of orthodontia, he did it on the same lines in which it was generally practiced ; that is : the only aim of the operator was to straighten the teeth, principally the anterior teeth, so that when the mouth of the patient is open, they appear regular.

As orthodontia advanced, an effort was made to also make the teeth more useful for the purposes of mastication, and attention was directed to the attainment of that result as much as to improving the appearance. That is the point to which it seems to have been carried, until Dr. Case took up the subject. He has certainly carried it far beyond that, and the term he has applied to it seems to me to be one that is very well adapted for the expression of what he really accomplishes. Aside from what has been referred to to-night, more is realized than any of us comprehend ; and that is, in giving character to comparatively characterless faces. Take for instance the case of the boy who has been mentioned. A man with any noticeable defect must battle against more odds than the man who is without defects. Because the face looks characterless is not necessarily an indication that the individual lacks character, or that he may not develop more than ordinary ability. The fact that a man is crippled does not detract from his mental ability. He may be just as able as the man who is not crippled ; but when this idea is applied to the face, it is a more serious question. We judge much by the countenance of the individual. So the addition of the appearance of character to the face is important. In the case of a woman there is also the creation of beauty. I have seen a number of the cases used for illustration by Dr. Case, and I am satisfied that the casts which we have before us do not give an adequate idea of the improved appearance. When we look at the models of a set of teeth, showing the condition before and after treatment, we are able to appreciate the change, if the model is correct ; but in taking the impression of a face a different factor is involved. Take for instance, Case I. Just as soon as the mind of that individual becomes active and the muscles of the face play, every deformed and defective feature is more strongly brought to the attention of the beholder. The individual appears homely or repulsive. This is generally true of deformity, but not necessarily of *homely*, *regular* features. When the cast is taken, that homeliness is largely obliterated because the face (during the making of the cast) must of necessity be in repose. On the other hand, after the face has been beautified you have in the cast a cold, emotionless face, regular in appearance, but lacking the beauty which mirrors the emotions of the mind as the face is in motion.

The apparatus which Dr. Case employs seems complicated, but, like all complicated things, is simple when understood. However, that matters little. The point which I wish specially to mention is, that the patients wear these appliances without any apparent annoyance, with far more comfort than appliances made earlier and which were supposed to be very simple.

I would suggest to the essayist that, in connection with the preparation of his models and casts of faces, he also take actual measurements both of the expansion and retraction of the jaws, and of the faces themselves, so that we may have for future reference some absolutely tangible and indestructible evidence of what progress has been made in this line.

Dr. W. H. JACKSON, Ann Arbor, Mich. As to the moving forward of the process, I know it can be done, as the doctor has said. I have in my own practice produced the same results, not in exactly the same way, but effectually, even where the intermaxillary process developed out of place, so that it left both cuspids standing out prominently and the incisors setting back even with the first bicuspids. The whole process, with those four teeth, was moved forward as a body, so that they came out even with the cuspids. There was a depression of the upper lip. The patient had been advised to have the lower bicuspids extracted and the lower teeth drawn back ; but I told her that would still leave the expressionless upper lip. If you drew the lower lip back even with it, it would leave a still worse condition, with the prominence of the chin and the very great prominence of the nose : I proposed to her that, although it would take a long time to do it, it would be much better for her to have the superior incisors carried forward. It took between ten and eleven months to move them forward, without doing it so fast as to cause absorption, as Dr. Case has said. If you move them too rapidly, you may cause absorption in almost any case ; and if you apply too great force, you may even cause a separation of the process between the teeth and crowd the front bony plate forward.

A great many times in regulating the teeth we come across cases where they are so rigid that it seems impossible to move them. You will find the rapidity with which you can move teeth depends upon the amount of connective tissue between the tooth and the alveolar process. If you have a considerable portion of connective tissue between the tooth and the alveolar process, it will move faster. If, on the other hand, there is very little, with little blood-supply, it is very difficult to get up irritation enough to cause absorption and the moving of the tooth.

Dr. J. TAFT, Cincinnati. I wish to ask Dr. Case if he has not found that there is frequently a change in speech as the result of these changes in contour?

Dr. CASE. Yes.

Dr. TAFT. And that the speech is always improved and never made worse?

Dr. CASE. I think that is true.

Dr. TAFT. Sometimes in the regulation of teeth difficulty will occur because of irritation or inflammation arising. I presume however, from listening to the paper, that the process is not pushed by Dr. Case to the extent of inducing irritation. I should like to ask him, has he found that there is a disposition to inflammation in the tissues, and does he not find it necessary sometimes to regulate the movements and the adjustment of appliances because of that predisposition?

Dr. CASE. Yes.

Dr. TAFT. Is it ever the case that special diseased conditions arise in the ordinary performance of this work?

Dr. CASE. I have never had any experience in that direction.

Dr. TAFT. I presume your work has been so well regulated that results of that kind have not occurred. I know that oftentimes in the regulation of teeth, when the pressure is too great and the movement too rapid, inflammation is set up, and I have known cases of teeth being devitalized, the pulps destroyed in that way. But I have no doubt that Dr. Case's appreciation of conditions that might arise would be so delicate that every difficulty of that kind would be avoided. A dentist sometimes says, "I moved that tooth a distance equal to its whole diameter in eight or ten days." "Did you have any trouble?" "Yes, it was sore; but what of it?—it got along." That occurs sometimes by the pressure of the tooth against the socket. But here the whole tooth is moved bodily, and in its vertical position, right along from one position to another, carrying with it the outer plate of the alveolus, the inner plate of the alveolus either following or the space being filled up,—the space that is made by the movement of the tooth. If that process was pushed very rapidly, I can conceive that in some cases there might be irritation. Then, again, here are the vessels, the tissues entering the end of the root. That moves, and the question occurs, may not that sometimes be affected by this movement? You have moved the tooth say a quarter of an inch, moved the foramen a line or two from the original position, and all that must be carried along with it, and the tissues must be distended, to accommodate this movement. I suppose that is the case where they are carried along in that manner.

Dr. CASE. Not exactly that. If the entire bone is bent forward with the end of the root, then the point of the root is not carried through the bone, and the foramen that comes down, carrying the vessels to the tooth, is also carried forward, is not left in its original position. That only occurs in those instances where the movement occurs only by absorption of the socket; and wherever that occurs, as I said before, the movement is always very slow; and I do not think I have moved the roots of a tooth—unless in one case—over an eighth of an inch. But where the entire bone can be bent forward, then the movement is always very rapid and quite extensive. Then the entire vessels and the bone itself seemed to be carried along together, and that also is a reason for not expecting so much inflammation as you speak of. And one of the great reasons why inflammation does not occur is, that the method of attaching the appliances and the method of applying the force holds these teeth firmly in their grasp. The force usually applied by those who regulate the teeth is a screw-force, which carries the tooth forward, and the next twenty-four hours it is carried a little farther forward. I used to have the same terrible condition of inflammation you speak of, when I used the old methods, the pressure and ligatures and rubber bands, but now I do not experience that trouble so often.

Dr. TAFT. I can readily see that you have a grasp upon the whole tooth; and it is carried along so that the force is distributed throughout the parts.

Dr. CASE. Yes.

Dr. TAFT. The whole moves along together.

Dr. CASE. Yes.

Dr. TAFT. And the vessels, and the tissue attached to the body of the tooth, accommodate themselves to the movement of the tooth.

Now, some cases seem to invite an operation of this kind. How often a bicuspid, or sometimes a first molar, may be removed early in life, and the second molar will move bodily right up to the posterior part of the second bicuspid. That is the same thing. It moves up from its original position, and sets right against the bicuspid. Not always, but oftentimes there is a successful effort of this sort by nature. And whenever nature makes an effort to repair things of this kind, the inclination should be to aid it. There will oftentimes, of course, be obstacles in the way that are difficult to overcome; but there often seems to be an inclination on the part of nature to help in these things, and, in the case of deformities, a tendency to work to a certain type, to repair a deformity.

The presentation of these cases and methods by Dr. Case has been of great interest to us all, though probably not more than one or two per cent. of us will ever attempt to do just the things he does, and in the way he does; but it presents to us all a striking lesson, and the query will naturally arise in the mind of every progressive practitioner, "Can I not do something to help the afflicted patients?" Dr. Case restores beauty. "Can I not help this deformity a little, by this or that arrangement?" And so gradually, I have no doubt, if this subject is kept before the profession, as Dr. Case is doing, by the presentation of these cases at our meetings here and there throughout the country, the result will be not only the presentation of what Dr. Case and a few others can do, but it will be helpful to us all, by showing what can be done. And then the question will arise, "Can I not also do something to relieve this suffering patient?" And so it will be helpful to every earnest, progressive dentist, and to our patients.

Dr. J. G. TEMPLETON, Pittsburg. I should like to hear from Dr. Case in reference to the use of retaining appliances, and what he thinks is necessary in this line.

Dr. CASE. Retaining the teeth in the position to which you bring them is quite as important as the regulation of them, and is, I have sometimes thought, the most difficult part of the whole operation. I wish I had time to describe some of the new appliances for retaining teeth which I have recently thought out. Patients object very much to wearing appliances that show in the mouth. They want to get rid of the whole thing as soon as possible, and I have invented some new things that hold the teeth perfectly in place and yet do not show any more than a gold filling between the teeth. At some future time I shall fully describe them, so that you will all understand.

Dr. GARRETT NEWKIRK, Chicago. I wish simply to add a word of testimony and of appreciation concerning the work of Dr. Case. I have paid considerable attention to the regulation of teeth, and my work in that line has been a source of great satisfaction to me and to my patients. I wish to call attention to the principle of the appliance for which, it seems to me, Dr. Case is entitled to the exclusive credit. The advisability of moving the end of the root has been understood for a long time, but just how to construct an appliance which would accomplish that result, and give the operator perfect control of the whole matter of the movement of the teeth, is something which no one has been able to accomplish satisfactorily heretofore. But Dr. Case has certainly solved the problem through a recognition of the mechanical principles involved. So far as I know, no one ever thought before of banding the tooth and having a lever carried from that band up to this point (referring to the model) in order to give him the proper direction of force. He controls it by this traction bar or wire. It is simply a study of the principle of the lever as variously applied. By this traction wire he controls the point of the tooth absolutely. By this nut he controls his force absolutely. He knows just what he is doing.

Now, a word as to the production of inflammation. With this kind of an appliance the danger is reduced to a minimum, because the tooth is held firmly. There is no action and reaction. There is no uncertainty of movement. On a No. 18 wire there are about ninety threads to the inch, I think, so that you know absolutely, if you give the nut one revolution, that you have a forward motion of one-ninetieth of an inch, while a half-turn gives one one hundred and eightieth of an inch. In almost any case you can control the amount of force, so that there is no possible danger of exciting inflammation. There is no more comparison between this sort of an appliance and our old regulating devices than there is between a nice watch and the old-fashioned threshing-machine. This is scientific, delicate, and positive. You know just what you are doing. So far as I am able to apply mechanical principles, in the few cases that I undertake, I am doing it on the same line with Dr. Case's scheme.

Dr. J. TAFT, Cincinnati. One thing which ought to be noted in connection with these appliances, is that the movement is positive. The tooth is moved up to a certain point, and retained there until the parts accommodate themselves to it, until the tissue impinged upon has accommodated itself to the new condition. It is very different from the spring, or the rubber bands so often used in the correction of irregularities, and there is not anything like the liability to irritation that there is from the spring. It is a positive movement and then a rest, allowing time for the accommodation of the parts.

Dr. N. S. HOFF, Ann Arbor, Mich. As I sat here to-night listening to this paper, I wondered if Dr. Case had not fixed these things up and brought them over here to make us believe that he was doing something in the line of art rather than practical dentistry. Now I believe he is doing both. It looks to me as though he was cultivating art, trying to assist nature to develop among his patients the beauties of art; and it would not be surprising to me, if after a while, to dentistry should be given the credit for a great advance in art, in a way that will take the laurels from the old masters.

As I looked at these drawings and as the discussion was going on, the question came to me, "How is all this beautiful development of the face accomplished?" As I understand from the paper, it is not accomplished by moving the tooth through the alveolar process, but by moving the bones themselves; and if it is accomplished in that way, what bones are moved? You cannot move the bones of the face around without leaving spaces, and the question arises, what fills the spaces, and where is this separation made? It occurred to me that, possibly, the cuspids were moved but little, and that this movement—especially where the process and the contour were developed—came about from the separation of the intermaxillary bone from the maxillary. But how can that be? The intermaxillary bone is united to the maxillary bone at a very early age, before the permanent teeth are developed, and the doctor states that many of these cases are fifteen, sixteen, or seventeen years old, and some older. At that period the intermaxillary and maxillary bones are certainly united, so that there must be a fracture or stretching of this union of the maxillary and intermaxillary bones between the lateral incisors and cuspids. The casts and models clearly indicate that it is the intermaxillary bones that are moved forward. I think if that is the case, if that is what is done, it will explain largely the way in which the force should be applied to develop this contour. The forcing out of the intermaxillary bones bodily would account for the lack of irritation and injurious effects to the blood-vessels and nerves, because we know that the blood- and nerve-supply of the cuspids is different from that of the incisors or the bicuspids. It seemed to me that this moving-out process is one comparatively easy to explain, on the theory of fracturing or separating the bones along this original developmental fissure. How can we explain the contrary process,—the forcing back of the bone? There could be no fracture of the bones in that way. In that case you must certainly move the teeth. I cannot see that anything could be accomplished in condensing the bone, but that you must certainly in that case move the teeth into the bone, or, by the continued pressure, produce absorption of the entire bone-matrix or condensation of its cells. Certainly, by making continued pressure upon the teeth in this direction, you do not produce displacement sufficient to accomplish what you evidently have done. Have you any explanation as to what change takes place in the bones structurally or anatomically?

Dr. Case. It is certainly very gratifying to me to hear so much said in praise of that which I have been able to accomplish, and it is especially pleasant to receive in this public manner the indorsement of my efforts, and the verification of the truthfulness of these models which I have presented for your inspection, from men who are well known in the profession, and who have been intimately connected with a number of the cases I have treated.

When I asked your committee to invite Drs. Cushing and Reid to open the discussion of my paper, it was because I learned they were to be here to attend your convention, and because they were eminently qualified, as eye-witnesses, to speak of the practicability of the treatment I have employed in a number of cases.

The suggestions made by Dr. Hoff in relation to the exact movement that really takes place, is something that it is impossible for me to answer. In the proceedings of the World's Columbian Congress, I mentioned the relation of the intermaxillary bone and its development, and, without giving any special opinion myself, I said that it was possible that that had something to do with the ease with which the four anterior teeth could be moved forward and, possibly, back. The subject of the movement of the roots of the teeth, even in a lateral direction, is one upon which there has been, for years, a great difference of belief among leading specialists in this department of dentistry; while the forward or backward movement of the roots of the anterior teeth with the entire bone in which they are imbedded is a subject so new and of such a radical advancement over former accomplishments in this line, it isn't strange that the profession are surprised and slow to accept or practice it.

(To be continued.)

## PENNSYLVANIA STATE DENTAL SOCIETY.

(Continued from page 849.)

### EVENING SESSION, JULY 9.

THE president, Dr. J. A. Libbey, in the chair.

A paper entitled "More Light" was read by Dr. EDWARD P. KREMER, of Lebanon, Pa. Following is an abstract:

It is our intention to treat our subject from a practical standpoint, and elucidate a few thoughts that have been borne in upon our mind during an experience of nearly a quarter of a century, and to offer a few modest hints which may possibly bring to others the same satisfaction which we have derived from them.

None feel more keenly the need of more light than the surgeon in the treatment of internal diseases, and the dentist in successfully combating the inroads of decay in cavities remote and difficult of access, and we do not hesitate to affirm that many a failure in the filling of difficult cavities is directly traceable, not only to their inaccessibility, but to disintegrated tooth-structure which, to the unaided eye and mouth-mirror, has remained undiscovered and formed the minute beginning which resulted in the loss of the filling and ultimately in that of the tooth itself.

How often is the vision strained to pierce to the apex a root-canal, and make sure by *actual seeing* that all foreign matter has been removed and treatment has been effective. There is small satisfaction in the results obtained by working in the dark by *feeling*, compared with the confidence which follows an operation every part of which was clearly seen by the eye, assisted or unassisted.

We would not for a moment be understood as asserting that all operations can be rendered plainly visible, but the cases are certainly plentiful where it becomes an absolute pleasure to fill an obscure cavity when illuminated by sufficient light, and additionally so when by other means every obstacle to the making of a perfect operation can be successfully eliminated.

It is not our purpose to speak of the lighting of the operating-room, to rehearse the advantages of a north or a west light; except in rooms built especially, the operator is frequently obliged to make the best of what he has, but there are aids which every operator can call to his assistance, in cloudy days or murky weather, without which he would be obliged to dismiss his patient or turn out unsatisfactory work.

A small incandescent light has frequently helped us out in a long-drawn-out operation when overtaken by twilight in the short days of winter, and, if only for the examination of the operation as it advances, is of incalculable value.

There is, however, another aid which it is the particular purpose of this paper to bring to your attention, which we have seldom seen employed, and which has proved of the highest value to the writer for a long period of years. We refer to the hand magnifying glass. The one we use is two inches in diameter, with a handle about three inches long. The lens is double convex, and, held between the first and second fingers and grasped by the thumb and first finger, can usually be held very satisfactorily while using the engine or electric mallet. This glass need only be used to be appreciated. Cavities prepared without it have only to be examined with it to bring out the surprising defects, which would otherwise be passed unnoticed. With it, and the hand-mirror to reflect light into them, every particle of unremoved decay, every white, chalky spot is immediately brought to view, and what would otherwise remain as a nucleus to undermine and finally destroy a presumably perfect operation, can be removed before the filling has been commenced.

The gold is introduced and malleted into place by its assistance with a certainty that is otherwise unknown. Especially is its usefulness manifested when malleting around the edges of the cavity, as is easily seen by discarding the glass after having used it for some length of time. It is only then found how dull and obscure the gold appears, and how any unevenness which was plainly seen before is lost sight of.

Again is its value manifested in the filling of cervical cavities, especially when using one of the numerous cervical clamps, which, no matter how valuable, always hide the cavity more or less. The magnifying glass brings into view the cervical margin of the cavity, which so frequently is difficult to distinguish from the tooth itself, and the imperfect filling of which is only discovered after the removal of the clamp.

To become proficient in the use of the glass requires some practice, and many may be tempted to throw it aside as an incumbrance before they have learned to accommodate themselves to it. The reflection from the windows in the glass, for instance, is annoying until practice indicates the proper angle at which to hold it. It is a matter of some time, too, to get the exact focus, especially when the operator uses spectacles. But let me assure every one who has never made use of this exceedingly useful adjunct in all operations within the oral cavity, that once he has become proficient in operating by its aid it will always find a place among his most valued accessories.

### *Discussion.*

Dr. S. H. Guilford, Philadelphia. I am one of those who have used the magnifying glass in dental operations very successfully, and with a great deal of satisfaction. While I was still a very young practitioner, I read an editorial that appeared in the Dental Cosmos by the then editor, Dr. J. H. McQuillen, in which he alluded to the importance of using glasses of this kind in dental operations. I did not feel that my eyes needed help at that time, for they seemed perfectly good, but I tried a magnifier and have used one ever since. I suppose a great many practitioners do use glasses of this kind in after-middle life, but they are as useful in saving the eyes of the younger practitioner as they are in helping the eyes of the older.

I first used the glass only in examining cavities after they had been prepared, and then after the filling was introduced and finished I would examine again to see if it was as perfect as I could make it. Of late years I have used it more and more. I use the ordinary jeweler's eye-glass, not holding it in the eye, but between the thumb and forefinger of the left hand, and I now employ it very largely throughout my operations, both in excavating and filling cavities. I find it has helped me; as the essayist says, it has often shown me imperfections that I did not know existed, and enabled me to remedy them before it was too late.

I think the essayist did not lay stress enough upon the fact that it gives us the means of examining the margins of a cavity throughout their whole extent; a little imperfection can readily escape us, but with the glass it is brought into full view. You can see where the defect is, and easily correct it.

Years ago, when there arose in my mind the question of whether the use of a magnifier might not be injurious to the sight, or place one in the way of depending upon it too much, I recalled a fact mentioned in the article by Dr. McQuillen. He spoke of Dr. Elisha Townsend, who had formerly been a jeweler, having used the eye-glass in watchmaking work, and introduced it into his dental work, When spoken to about the danger of its weakening the eye, he remarked that his "glass" eye, as he called it, was the better eye of the two. Watchmakers do not find that the sight is impaired by the use of the glass, for the eye gets accustomed to it.

It seems to me that it is a very important matter to take advantage of all the help we can get in making our operations as perfect as possible, and I know of nothing that helps us so much as the use of the magnifying glass.

A MEMBER. How do you succeed in focusing the jeweler's glass?

DR. GUILFORD. They have a focus of from three to three and a half inches, and when you become accustomed to one, it is very quickly adjusted. The focusing seems to attend to itself.

Another point the essayist makes is that you can use it on dark days. If you hold a piece of paper so [indicating], in the form of a tube, you can see a star in the day-time that would not otherwise be visible; it is on the same principle that a star can be seen from the bottom of a deep well,—the tube excludes all extraneous light and allows only the rays to go through that can be of use. On dark days when I needed a little more light, by holding the glass and looking through it I have been enabled to complete my work without strain.

A MEMBER. Have you any trouble from the condensation on the glass of the moisture from the breath?

DR. GUILFORD. Very little. It is not near enough to the breath; you don't hold it in front of the patient, but above him. Frequently I illuminate the root-canal with the mouth-mirror and then use the magnifying glass to enlarge the view. In this way I am enabled to see almost to the end of the canal.

DR. YOUNG. Is it not unhandy, used for the upper part of the mouth?

DR. GUILFORD. You can use it anywhere: on the lingual or palatal side of the superior incisors, or on the distal surfaces of the molars, with the aid of the mouth-mirror.

Dr. E. T. Darby, Philadelphia. There is one other kind of glass I find of great value. Some years ago, Dr. Perry, of New York, sent me three or four magnifying glasses. I had my man make some little German silver frames for them. They were concave mirrors intended for microscopic work; some of them no larger than a half-dollar, and the largest one two and a half inches. They magnify a great deal. I use them by letting the glass rest in the mouth; I illuminate the whole anterior part of the mouth, and in a mouth of pretty good size I can illuminate back to the molars. I work by reflected light.

The lenses that Dr. Kremer and Dr. Guilford spoke of are certainly a great help to the practitioner.

Thirteen or fourteen years ago I picked up in a little optician's shop, in Paris, the nicest one I ever saw, mounted in an ivory frame, about an inch and a half in diameter, with a nice little turned handle. I have used that for thirteen or fourteen years. I use it a great deal, especially in the anterior part of the mouth, where I can get the direct rays of light through it. They are certainly a great help. I cannot use them as Dr. Guilford suggests, by reflection and throwing the light on a second mirror; that confuses me a little, to throw light on the mirror which illuminates the object, but where I can get direct light through it, I find it is of the greatest service to me. In the preparation of a cavity it is of great service in determining whether all the carious matter is removed.

I commend most heartily all that Dr. Kremer has said in reference to illumination.

Dr. Smith. Is it a practical thing to put it on a little handle or stick, and hold it between the teeth?

Dr. Guilford. Dr. Flagg does that, and has done it for a good many years: he is the only man that I know of who uses it in that way.

Dr. Smith. I asked because so much has been said about getting it adjusted to the proper distance or focus.

Dr. Guilford. Dr. Flagg's glass is a small one.

Dr. J. D. Thomas, Philadelphia, then read a paper entitled, "The Anesthetic and Asphyxiating Effects of Nitrous-Oxid Inhalation." The paper appears in full at page 932 of this number.

### *Discussion.*

Dr. W. F. Litch, Philadelphia. I fully concur with the essayist in his contention that the phenomena of nitrous-oxid narcosis are the result of a specific anesthetic effect upon the nerve-centers, and that they are not simply due to asphyxia as a result of deprivation of oxygen; still the whole subject must be recognized as one of very great obscurity and difficulty.

We have two classes of facts confronting us.

First, the well-known fact that $N_2O$ will not only not sustain life, but will prevent the evolution of life processes in seeds which in the presence of air would germinate.

Second, the fact that there is always more or less asphyxia associated with anesthesia by nitrous oxid as ordinarily administered.

Third, the fact, as shown by Dr. Wood, that by simple deprivation of air, an anesthetic state, with abolition of the corneal reflex, can be produced.

Fourth, the fact that by nitrogen alone a condition of insensibility to pain has been produced, as was shown by Professor Burdon Sanderson in 1868, and by others later.

On the other side of the question, we have the fact that Paul Bert produced full anesthesia with nitrous oxid, even though commingled with from fifteen to twenty per cent. of oxygen ; this result being effected under special conditions, in a pneumatic chamber and under increased atmospheric pressure. Professor Bert has now gone over to the majority, and the pneumatic chamber is probably not much used, although it was at one time considerably employed in the hospitals of Paris. Claude Martin also had constructed for himself a pneumatic chamber, and carried out, with a mixture of nitrous oxid and oxygen, an exhaustive series of experiments, and with entirely successful results, the anesthetic effect being in some cases prolonged for twenty minutes, and without the slightest evidence of asphyxia.

Even more strongly confirmatory of the theory that anesthesia with nitrous oxid is not simply asphyxia, is the fact that even at normal pressure, by the aid of the inhaling apparatus of Dr. Hewitt, of London, or that of Dr. Hillischer, of Vienna, perfectly satisfactory anesthesia can be produced with nitrous oxid, mixed with sufficient oxygen to entirely prevent all symptoms of asphyxia.

These, and allied facts, are the great stumbling blocks to the acceptance of the asphyxia theory of nitrous-oxid narcosis. We can hardly believe that the anesthesia of nitrous oxid, prolonged as it may be and has been for fully twenty minutes, is simply a twenty-minute asphyxia ; for a person truly asphyxiated for that length of time, as by drowning, would be beyond all means of resuscitation.

The whole subject requires thorough revision, in the light of the most recently ascertained facts. Nitrogen is a mysterious agent, the potencies of which we have hardly yet fully measured. The fact that there has been but recently discovered in the nitrogen of the atmosphere a hitherto unknown element,—argon,—is certainly an intimation that there yet remains something to be learned in regard to the constitution and properties of the gases of which our atmosphere is composed.

The generally-received opinion that the nitrogen and oxygen of the air are simply in mechanical admixture under the laws governing the diffusion of gases, may yet require modification, for it seems difficult to believe that two elements so diverse in their atomic properties as nitrogen and oxygen could maintain those definite proportions in which they are found at all altitudes without the existence of some feeble bond of chemical affinity, and it may yet be found that the nitrogen and oxygen isolated by the chemist are destitute of properties which pertain to them when combined in the aerial envelope of our globe.

As bearing upon this point, the observation of Dr. Leaff, who supplemented the experimentation of the Hyderabad Commission, is significant ; he found that in resuscitating, by forced respiration, animals which had apparently been fatally narcotized by chloroform, he was much more successful with air than with pure oxygen. By pumping air through a canula introduced into the trachea of a chloroformed dog, he was able in one case to resuscitate the animal, although respiration had ceased for a period of six minutes and twenty-five seconds. The same method of lung inflation, practiced with pure oxygen, failed to restore respiration after a longer period than one minute. Manufactured air for purposes of respiration is probably as inferior to that prepared in nature's laboratory, as are manufactured foods to natural foods for purposes of nutrition.

Dr. GUILFORD. This question is a very interesting and a very important one. Some fifteen years ago, in an article I wrote on nitrous oxid, I made the statement that its exact physiological action was not fully understood. I think that statement is just as true to-day as it was then.

I am one of those who believe that it possesses anesthetic properties in itself, entirely independent of asphyxia. It is certainly true that in many cases where the gas is administered we do have the symptoms of asphyxia, such as blueness of the lips and eyelids, etc.; but you must remember that those peculiar manifestations, so strongly resembling asphyxia, were much more prevalent in the earlier days than they are to-day. When we made our own gas with retorts and wash-bottles we probably did not manufacture it in as pure a condition as it is done to-day, and that was one reason (owing to certain impurities not eliminated) why we had the asphyxial conditions so strongly manifested.

Another point is that in those days of administering gas the inhalation took place through a very small, or comparatively small, opening, and the gas could not enter the lungs with the same freedom as the air does. These are the two prominent reasons why we had those peculiar manifestations of asphyxia.

Now, one was eliminated just as soon as we learned how to manufacture the gas in such a way as to be entirely or almost pure. Dr. Thomas knows how to do it, because he has had so many years of experience. We get our gas pure to-day because it is carefully manufactured on a large scale for commercial purposes, and we have all noticed that since we receive it in the cylinders furnished us the symptoms of asphyxia are not nearly as common as they once were.

If the anesthesia produced by nitrous oxid is due to the exclusion of oxygen from the lungs, why is it that we have the same anesthetic effect when more oxygen is added, and do not have the asphyxial symptoms? It seems to me that is a point which has been overlooked by Dr. Wood in his experimentation. Another point he made was in regard to the time it took to produce unconsciousness or anesthesia by deprivation of oxygen, and by giving nitrous oxid, which you may remember were very similar indeed. The correspondence in time was so close that he was naturally led to conclude that nitrous-oxid anesthesia was nothing more than a condition of asphyxia; but what proves that it was not so is the fact that by our modern methods and better understanding of the subject, we are able to reduce the symptoms of asphyxia to a minimum.

By combining oxygen with nitrous oxid we get anesthesia without any unfavorable symptoms, and that fact seems to me to indicate that nitrous-oxid gas possesses anesthetic properties in itself. Experiment shows that the gas comes out of the body in the same condition that it went in, and that is a fact taken advantage of to prove that it acts simply by depriving the lungs of the natural supply of oxygen, but I have no hesitation in saying that in my own mind I am perfectly satisfied that nitrous-oxid gas possesses anesthetic properties inherent in itself,—peculiar to itself.

Dr. DARBY. I was very much impressed last summer in seeing Dr. Hewitt administer nitrous oxid in combination with oxygen, in London. Dr. Hewitt had an apparatus for administering nitrous oxid in combination with oxygen, and the effect upon the patient was exceedingly pleasant to those of us who were on-lookers, because there was an entire absence, except in a single instance, of any of the peculiar symptoms recognized when we administer gas ordinarily. Dr. Thomas has intimated his method of preventing that difficulty by allowing the patient, at certain intervals, when he deems it necessary, to inhale a certain proportion of air.

Dr. Hewitt's method of administering was by a combination apparatus. He would turn on a certain percentage of pure oxygen, and when he saw indications that the patient required it, he would turn the valve a little, and give the patient a little more oxygen.

Whether it would ever be used successfully in this country, I somewhat question, because it always requires an attendant to manage the gas apparatus itself; and there are very few, except specialists, who would take the trouble to administer an anesthetic that required an extra attendant to assist them.

Dr. M. H. CRYER, Philadelphia. I was present when Dr. Darby saw the administration of gas, as described by him, and was very much impressed with it. After returning home, I procured an apparatus from London, and have been using it, not only in private practice, but in clinical work, with great satisfaction.

Some years ago I was very much opposed to the use of nitrous oxid. I had no special reason, but did not like it,—I suppose on account of the coloration of the features and bad symptoms after its use,—but after seeing Dr. Hewitt administer it in combination with oxygen, I felt as though I must use it instead of ether, for minor operations. Dr. Dorr and I together have administered it to a few patients as a preliminary to ether-anesthesia, giving one part of oxygen in ten, then two, three, four, until we gave equal quantities of nitrous oxid and oxygen. When the patient became perfectly anesthetized, we removed the gas apparatus and carried the anesthesia on with ether, for half an hour, with perfect success.

It has this advantage, used in that way, that the patient is carried under the anesthesia without the struggling stage that we generally have with ether alone.

Professor Dorr became very ill in the early part of March, and we have not had a chance to carry on the experiments. I have administered the anesthetic to two or three in that way, since, with great success, and believe that with the use of nitrous oxid in combination with oxygen, the patient can be completely anesthetized in from one and a half to three minutes, and kept in that condition afterward with ether, without any of that ugly struggling we usually have when using ether alone.

Subject passed.

(To be continued.)

# AMERICAN DENTAL ASSOCIATION.

(Continued from page 886.)

## SECOND DAY—*Morning Session* (Continued).

A PAPER by Dr. WILLIAMS DONNALLY, of Washington, D. C., entitled, "A National Dental Museum and Library," was read by Dr. J. D. Patterson, of Kansas City. Following is an abstract:

Dr. Donnally's paper was a strong plea for the acceptance of the offer of the Army Medical Museum and Library, at Washington, D. C., to provide room in a fire-proof building for a national dental museum, with proper facilities for the exhibition of the specimens, and as well to care for them without charge. Tracing the origin and uses of the museum from the earliest period to the present time, he showed the development of the modern idea of the value of such institutions as aids in the acquirement of knowledge; as Professor G. Brown Goode puts it, "the most powerful and most useful auxiliary of all the systems of teaching." "They are houses full of ideas," and their laboratories and libraries are the best to aid in original investigation and the extension of the bounds of knowledge. They are fast becoming the centers of learning, where the men of greatest attainments in science will be found.

Passing to the consideration of the Army Medical Museum and Library, Dr. Donnally presented a mass of interesting information concerning it. Much of this was contributed by Dr. John S. Billings, Deputy Surgeon-General and Librarian in charge, whose keen appreciation of the ideal medical museum and library, wise administration, and herculean labor have brought to the institution universal renown and the well-deserved appreciation of the whole medical world. It includes human anatomy, physiology, pathology, somatological anthropology, instruments and apparatus, and illustrations of methods of teaching connected with special departments of practical medicine. It is not an anatomical, but a medical museum. On June 30, 1894, it contained 32,269 specimens, of which 12,249 were pathological, 4376 anatomical, 1717 illustrative of comparative anatomy, 12,033 microscopic, and 1394 miscellaneous. Laboratory work is constantly active, largely in bacteriology, embryology, and microscopy, some work having been done in the embryology of the teeth and jaws.

As showing the wonderful growth of the library, it was stated that in March, 1895, it contained 112,000 bound volumes and 180,000 pamphlets. At the time the paper was written, some four months later, there were 114,567 bound volumes and 183,778 pamphlets on its shelves. It contains three-fourths of the medical literature of the world, and nine-tenths of the medical literature of the last ten years. There are about 53,000 visitors to museum and library annually, and the library is used by over 3000 students in the same period. The library receives all the medical periodicals from all over the world and in all languages, to the number of 1200. The government appropriates $12,000 annually for the purchase of books and pamphlets, but the library grows largely through the donation of private collections and the gifts of individuals. There is pouring into it a constant stream of literature, not only from this country, but from abroad. It not only contains more literature than the library of the

British Museum or the National Library of France, but it covers a wider field, represents better the medical literature, and is decidedly a better practical reference and working collection for medical purposes than either of the great libraries mentioned.

Two publications emanating from this library have a world-wide reputation—the "Index Medicus," of the current medical literature of the world, which appears monthly, and the Catalogue, which contains references, by subject and author, to every bound volume and pamphlet in the library, and all the articles of value in the magazines, indexed under subject heads. Fifteen volumes of the latter publication have so far been issued, with an average of over 1000 pages each.

Each of the medical specialties is represented in the two branches of this institution, though the number of works relating to dentistry in the library is far below a creditable showing as compared with some of the other specialties, and the specimens in the museum but the beginning of a collection. The members of the profession alone are to blame for this, as Dr. Billings's efforts to awaken the dental profession to a conscious sense of its interests in this regard have met with but little success.

Here has been prepared for our acceptance and made available for our use, without effort or expense on our part, an institution offering grand opportunities almost wholly neglected,—neglected in a way that does not comport with the dignity, aims, and boasted achievements of dentistry. It cannot but seem to some that we shrink from bringing to this great institution the evidences of our professional attainments, to stand side by side in comparison with those of other branches of the healing art.

Although the Army Medical Museum and Library is a branch of the medical department of the government, housed and maintained by congressional appropriations, it is the recognized and officially accepted National Museum and Library of the medical profession, and as much or more the pride and interest of the individual members of the profession as if under the control of their national organization. As a government institution, mature in experience and with an established policy, it is certain to be perpetuated under competent management.

Thousands will form their estimates of the value of the attainments of the various branches of medicine and surgery by comparing here their exhibits of specimens. For this reason, and because so much of dentistry can be illustrated by models, drawings, etc., we should make this the greatest object-lesson in the world. Nowhere else could we so well impress on army medical men and government officials the necessity and duty of providing denta surgeons for the army and navy ; and in no other way so well educate people of influence to comprehend the need of teaching and practically enforcing dental hygiene in the public schools.

The quantities of museum material in single specimens and small collections hidden in offices for a time and then cast away, lost to the profession because of the supposed want of a safe depository, would be of value to the profession and the student if sent here, where their usefulness would be increased by association as parts of a complete series.

Dr. Donnally, in closing, urged the consideration of the opportunity afforded by this National Medical Museum and Library to *accumulate*, *preserve*, *and exhibit*, at government expense, ample stores of literature and museum specimens to illustrate our history, progress, and attainments, and to evidence, as we can in no other way, our claim to the attributes of a liberal profession.

On motion of Dr. CROUSE, a committee, consisting of Drs. H. A. Smith, L. D. Shepard, H. B. Noble, L. L. Dunbar, and H. W. Morgan, was appointed to examine the books and accounts of the Dental Protective Association and report to this meeting.

The committee reported at a later session that they had examined the books, papers, and vouchers of the treasurer, Dr. J. N. Crouse, and found them correct. The committee also bore strong testimony to the careful management of the affairs of the association by Dr. Crouse.

Adjourned until 4 o'clock P.M.

### *Afternoon Session.*

The association was called to order at 4.10 P.M. ; Vice-President Watkins in the chair.

Dr. ALONZO BOICE, of Philadelphia, chairman of the Committee on the History of the Census Classification, presented his report, which was partially read and ordered printed in the Transactions. An abstract follows :

The report, which covered some forty type-written pages, showed that the first recorded protest against the proposed classification of dentists as manufacturers was in the form of a communication, dated September 1, 1890, by Dr. Richard Grady, of Baltimore, printed in the *Baltimore News*. The first action by an association of dentists was taken by the Association of Dental Surgeons of Baltimore City, September 12, 1890. The course of the movement which eventuated in the amendment of the Willcox Bill, whereby professional men, including dentists, were exempted from the provisions of the census enactment requiring them to furnish statistics concerning their business under the schedule of manufactures, was traced in detail, the exhibit including the action of various societies in the premises, correspondence with the officials of the Census Bureau, newspaper articles, etc.

The report of the Horace Wells Memorial Committee was read by its chairman, Dr. JOHN D. THOMAS, of Philadelphia. The report rehearsed the proceedings at the Horace Wells memorial meeting held in Philadelphia, December 11, 1894, a full report of which has appeared in these pages. The committee desired that the proceedings and addresses be preserved in a memorial volume. They had solicited subscriptions at $1.50 per volume, but had as yet received but forty subscriptions. They therefore asked that enough members of the association should subscribe to warrant the publication of at least one hundred copies.

The report was referred to the Finance Committee.

Dr. Donnally's paper, read at the morning session, was then opened for discussion.

Dr. M. F. FINLEY, of Washington, D. C., moved that this association formally adopt the Army Medical Museum and Library as the National Museum and Library of the Dental Profession of the United States.

In support of his motion, Dr. Finley said that the American Medical Association has formally adopted this museum, as had also several of the specialties of medicine. Dr. John S. Billings has also strongly recommended this course.

Dr. CROUSE wished to know what expense would be entailed by the adoption of this motion.

Dr. J. D. PATTERSON, of Kansas City, said that if any of those present had never visited this museum, a single visit now would make them heartily favor the motion offered by Dr. Finley. The Army Medical Museum and Library is certainly the place to found a dental museum, if such a movement is to be made.

Dr. J. TAFT, Cincinnati, Ohio, had visited the Army Medical Museum and Library two years ago or so and had had a conference with Dr. Billings, who is quite anxious for dentistry to have proper representation within its halls. It already has the nucleus for a dental library and museum, and the movement should be carried forward. There will be no expense attached to the adoption of the proposition, except that of sending or placing specimens and contributions. Such specimens appertaining to dentistry as are already in the museum are now placed with specimens from other departments, but the officers of the institution are willing to furnish a room, amply sufficient in size, and fire-proof, for the special purpose of keeping dental specimens, if the proposition is accepted. Another reason why we should aid in this movement to make a really National Dental Museum is, that many of the books and specimens there are in duplicate, and they can be had in exchange for others and so help to enlarge the museums and libraries in the dental colleges. He could hardly conceive of any better object than the establishment of this museum.

Dr. Finley's motion was adopted.

Dr. DONNALLY then moved the appointment of a committee to co-operate with the authorities in establishing the dental museum. He stated that the government allows annually $30,000 for the maintenance of the Army Medical Museum and Library, and $12,000 for the purchase of literature, including the journals. He had been informed that from $1200 to $1500 of this amount would be available for dental works, if it should be required. The museum now takes all the dental journals published in all languages, so far as they are known to them.

The motion was adopted, and at a later session the committee was announced as follows: Drs. Williams Donnally, J. Taft, H. J. McKellops, L. D. Shepard, and Henry W. Morgan.

Adjourned until 7.30 P.M.

### *Evening Session.*

The association was called to order at 8 P.M.; Vice-President Watkins in the chair.

Dr. W. W. WALKER, Chairman of the Executive Committee of the World's Columbian Dental Congress, announced that the final report of the treasurer of the Congress was ready and would be read by the treasurer, Dr. John S. Marshall, of Chicago.

Dr. MARSHALL read the report, which was received.

Dr. Lyman C. Bryan, of Basel, Switzerland, was unanimously elected an honorary member of the association, on motion of Dr. CROUSE.

Dr. LOUIS JACK, Philadelphia, read the stated address which he had been appointed to deliver, an abstract of which follows:

Dr. Jack's address, which was entitled "The Struggle for Professional Life and Its Relation to Practice," considered especially the forces with which the struggle for true professional life is beset, and the cultivation of the faculties with which they can be overcome. The practice of dentistry, he said, is attended with large and exacting responsibilities, requiring the mastery of the principles and sciences related to the practice of medicine and surgery, the special knowledge of dental science, and the skill in technique and mechanics demanded to give it practical efficiency. Those entering into the study of dentistry should appreciate their relations to the community. The student must be faithful and diligent, devoting his time to study and research, and keeping personal pleasure in the background or as a means of necessary recreation only. This severe devotion should commence with the first period of student life, that each day's instruction may be prepared for by what has gone before. Doubtless the deficiencies of many in practice can be traced to waste of time and inattention while at school. The consequences of this carelessness are far-reaching. The battle-sword which every one, sooner or later, must wield against the "dragon Fate" has been blunted. This fate is that limited capacity resulting from the inheritance of ordinary mental qualities, overlaid by evils of indolence and self-indulgence, with a possible unfavorable environment. Against these must every man do battle. The brightest and most useful men of all ages have been those who have taken up this gage of battle by faithfully devoting themselves to master their mental environment.

It is not the necessity for exertion to satisfy the demands of the physical nature to which this refers, but to that higher form of struggle growing out of competition with other minds, and to that still higher, the impulse to reach the highest state of professional life. Adjustment to environment is what is really meant by "the struggle for life." This struggle for professional life is involved in the demands upon the immature student; it continues through early manhood, and must be kept up until the end. It is this constant effort which maintains the life of this and of all professions. Those who do not engage in it inevitably become inert and must drop out. The "survival of the fittest," as we see it in nature, is not the harsh and cruel necessity it seems, but is the path along which the highest development has been reached, and the condition upon which advancement is dependent. It is therefore a beneficence, and must be the same in professional life. This struggle is upon all of us, for whatever man needs for the building up of his powers involves it. The great purpose of life is the development of character, which is the toilsome rearing of truth upon truth, and cementing them into the mental constitution.

The motives which enter into the development of professional standing are, the spirit of usefulness to mankind, loyalty to one's profession, and personal benefit. The first inclines toward the acquirement of knowledge, and the growth of powers which increase the value of service to others, and where the motive is genuine there is no stopping place. The second motive force, loyalty to one's profession, may fittingly be compared to patriotism, and each devotee owes to his profession the service of his mind, that it may grow in strength and honor, and as well the duty to use this power for good to protect it from the injurious influences which menace its advancement. The influence of these two motives upon the individual is always potent; they react upon the personal benefit, and he who is improved by these higher impulses casts about him a wide-spread influence which is constantly securing a legitimate personal benefit. If that which should be secondary—the personal advantage—is made the primary object, professional spirit is retarded, the individual is narrowed, his views become warped, he loses the sense of honor and becomes like the sponge,—growing only to absorb.

Section III, Operative Dentistry, was called, and Dr. JACK, its chairman, read the report, in which was noted as a marked feature of the year's progress the application of electrical force in the practical treatment of dental caries. It is being successfully used for obtunding dentinal sensibility by cauterization, for the removal of caries and formation of cavities, for packing and finishing metal fillings, and for bleaching teeth by cataphoresis. While these operations are not all entirely new within the year, they have undergone great improvement and have gained wide acceptance.

The treatment of erosion by magnesium hydrate; the use of sulfuric acid for enlarging the orifices of root-canals; and the filling of root-canals with salol, are new and acceptable propositions. The removal of pulps under paralyzation by cocain, and the bleaching of discolored dentine with ethereal solutions of hydrogen dioxid and sodium dioxid, have become more generally effective through intelligent description by various members of our profession.

With respect to the packing of gold for fillings, scarcely any novel features have been presented; but the section would call attention to "A Method of Inserting Gold Fillings with the Use of Hand-Burnishers," by Henry F. Libby, in the *International Dental Journal* for July, 1895. There have been increasing indications of the necessity for general instruction in the methods of using gold foil non-cohesively. The complaint is given out that this mode is not practically taught in the schools, and it would appear that the use of non-cohesive foil can be taught only in schools which conduct manual training.

The combinations of tin and gold and amalgam beneath gold have been on the increase. The combination of zinc phosphate with metal fillings has been widely recommended, but without sufficient caution concerning the solubility of the cement wherever the fluids of the mouth have access to it. The overwhelming increase in the use of plastic filling-materials, many of the formulas for which are very indifferent, raises the serious question, in view of the temporary duration of most of the cement fillings, whether dentistry as an art and our own standing as a profession are not in danger of a serious decline, and also whether American dentistry is not falling into the conditions of practice which greatly prevail in Europe.

The report concluded with the announcement of a number of papers, the first of which, "The Office and Eccentricities of the Dental Pulp," by Dr. D. D. Smith, of Philadelphia, was then read by its author.

Dr. SMITH did not expect to offer anything specially new upon the office of the dental pulp, but he hoped to present certain phenomena and facts in new groupings. The intention was to speak of the part the pulp plays in the economy of tooth-solidification and of the deductions therefrom.

The full apprehension of the fact that the different formations which make up the body of the tooth receive life and nourishment from two distinct sources, the pulp and the pericementum, and of the phenomena arising from it, will greatly assist in establishing rational and substantial methods for the treatment and saving of teeth. The pulp, which is made up of nerve-tissue and of vessels for the supply of nutriment and for taking up waste, is the important factor of every tooth. To it is committed the care of the newly-erupted tooth, to readjust, recalcify, consolidate, strengthen, and sustain the enamel and dentine. Hence Dr. Smith emphasized the importance of keeping the pulps of young teeth in a condition of healthful activity, carefully guarding them against any encroachment through decay or manipulation. He placed use of the teeth in mastication, for children, before inheritance as a factor in determining the character of the teeth. Natural and healthful mastication, the true cleaner of the teeth, would alone force that exercise required by the pulp and peridentium. Devitalization of the pulp at an early period of life carries with it more or less rapid retrogressive changes in the quality of tooth-material without power to arrest it.

So general is the action of the pulp in rearranging, depositing, and solidifying the materials of the dentine and enamel of young teeth, that a tooth, fragile and imperfect at eruption, if introduced into conditions of use and cleanliness, and the pulp protected, may be built into an organ of good type, practically decay-resisting. Isolated instances of this have been observed, but are regarded as exceptional rather than as the true expression of pulp-action. Are not the teachings of the past and present wanting in giving the position of supreme importance to operations upon the externals of the tooth, and would it not be more in harmony with the true science of tooth-building to emphasize the matter and manner of pulp-protection in young life?

The paper then laid down the proposition that there comes a time when the pulp, with all the importance attaching to it in early life, may be dispensed with; that a pulp which has been maintained in a tooth to full maturity of the individual, say to the age of twenty-five to thirty-five years, has accomplished all that it will or can do for that tooth in the way of consolidating and strengthening the osseous structures of the tooth; that its continued presence may even cause mischievous interference, as in the deposit of nodules of dentine, or pulp-stones, sometimes ossifying the entire coronal portion, or even sending out notice of the mummifying of its entire substance by ejecting into all the tubuli and the connective tissue of enamel and dentine an offensive coloring matter, which baffles all efforts for its removal. Again, later in life, teeth which have been decay-resisting for fifty or sixty years, seemingly change in structure, assuming apparently a state of partial decalcification, as evidenced by their yielding more readily to decay. In a few more years it is not uncommon to find extensive decay throughout the remaining teeth. Investigation shows a positive change in the structure ; the tooth has softened. What has wrought the change but the same pulp which previously built and consolidated the osseous structures of the crown, again at work, but now transforming the compact material which it placed in the tooth into a condition wherein it yields much more readily to decay?

The practical deduction is that, if we destroy the pulp when the tooth is at its best, by no vital process can there be, later in life, any change of the compacted materials of the dentine and enamel into any better or poorer formation. As the tooth is when the pulp is destroyed, so it must remain, except as to the changes through the gradual disintegration of the internal structures of pulpless teeth ; and who would venture the prediction, with present methods of treatment, that a pulpless tooth would not continue in service to the end?

One other point : It may yet be demonstrated that the action of the pulp extends a more or less potent influence into the territory of the cementum, transforming it into a tissue resembling dentine more than bone. If so, it suggests a possible explanation of some of the unexplained manifestations of pyorrhea alveolaris.

If it should hereafter be found that the pulp sends a consolidating influence into the territory of the cementum, so rendering it obnoxious to the pericementum, there will be found favorable conditions for the beginning of pyorrhea ; and a probable solution of the exemption of pulpless teeth from beginning pyorrhea, of why soft, young teeth are not affected, and why it is pre-eminently a disease associated with the hard, strong teeth of adult life.

It matters little what becomes of the pulp of a mature tooth,—if the cemental structures of the root are in normal condition, it can be restored ; but a tooth, after the absorption of process and its peridentium, can never be.

The writer therefore concluded that the pulp is an organ of the greatest importance up to the period of tooth-consolidation ; that after that for a considerable period it would seem to be of little service to the tooth ; that later in life it may become a source of injury and trouble ; and that in discussing the causes of pyorrhea, age, tooth-structure, and pulp-action, as well as local irritants and constitutional vice, must be considered before it can be said that the origin of this troublesome concomitant of dental practice is satisfactorily defined.

Dr. J. D. PATTERSON, Kansas City, read a paper entitled "The Necessity of and Methods for Better Pulp-Protection in Filling Teeth." An abstract follows :

Dr. Patterson, at the outset of his paper, stated distinctly that it referred only to fairly deep-seated cavities in the teeth of patients under twenty-five years of age, which are usually filled without any endeavor to prevent pulp-irritation, because preventive measures do not seem necessary. Every observant practitioner has seen numbers of severe pathological conditions arising in this class of cases from death of the pulp years afterward. While immediate or soon-occurring trouble usually finds ready cure, where pulp-death comes from long-continued, generally imperceptible irritation the danger is greater, and the most skillful are unable to abate the alarming and rapid process of destruction.

Diagnosis shows why these cases are so difficult to control. When the irritation is slight, the pulp responds without noticeable pain to its physiological action; the odontoblasts are excited to renewed activity, pulp-calcification proceeds slowly, and the patient is not warned of trouble. Eventually a portion of the pulp is deprived of function, and the destructive process has begun which results in the total obliteration of the pulp-contents. If the putrid pulp-contents are rapidly forced through the apical opening immediate abscess results; but in the slower process, from slight irritation and gradual disorganization, the poisonous matter infiltrates into surrounding tissue in small quantities and intermittently, so that nature is able to destroy the pathogenic bacteria and absorb the detritus, though the investing tissues become weakened in the process. Pathologists know that an abscess voiding intermittently will seek new points of outlet, following more easily the healthy tissue than cicatrized territory. Each fresh invasion prejudices new territory, until the surrounding alveolar process and periosteal tissue, often to distant points, is weakened and predisposed. The anti-toxic proteids of the leucocytes are used up, the inflammatory products can no longer be absorbed, and a severe and rapid inflammation ensues,—at times eventuating in great loss of process and teeth through necrosis.

Dr. Patterson presented two cases in illustration of his argument. In the first, a young lady of twenty years of age, five teeth and the surrounding process were lost, the inflammation beginning thirteen months after a small gold filling, which did not approach the pulp half-way through the dentine, was inserted in a lateral incisor. When trouble first showed, the lateral was drilled into, and mummified pulp-remnants were found. In the second, a young man of twenty-one, the death of the pulp resulted from a cement filling inserted in the central incisor seven years before; the inflammation was more rapid, and the destruction greater. In both cases physicians were at once called and the most approved treatment given. In neither patient was any hereditary taint found.

In considering the various methods of pulp-protection, Dr. Patterson recommended the banishment of oxychlorid and oxyphosphate cements, because their irritating quality destroys the pulp in young teeth quite as often as does cohesive gold through thermal changes. The various disks gummed to place are not suitable save where the decayed tooth is accessible and there is plenty of cavity depth, and they are also wholly unsuited as a foundation for gold. Gutta-percha, of all the materials commonly used, stands easily in first place, but it cannot be used save in deep cavities where there is room for a good layer of cement over it upon which to condense the gold.

In the writer's own practice non-cohesive gold is used for pulp-protection almost to the exclusion of all other materials. The old-time non-cohesive gold fillings of forty years ago were often found, when removed for various reasons, to have been placed over pulps protected by an extremely thin layer of dentine, without causing uneasiness from thermal changes; if cohesive gold was used in refilling, the pulp was at once affected by hot and cold liquids and by cold air, often resulting in pulp-destruction. Indeed, so far as the writer could remember, the bugbear of thermal changes came in with cohesive gold and the mallet.

The philosophy of the difference between the two forms is that the non-cohesive filling is in no way a cohesive mass, and the thermal shock is conducted along the layers and not down to the bottom of the cavity, while the cohesive filling has the conductivity of cast gold. He had thus been led to believe that the non-cohesive gold was an admirable pulp-protector. A pad of sufficient thickness, made by doubling strips upon one another and burnished over the pulp, has secured the best of results. It is everywhere applicable, and the filling may be finished with cohesive gold, amalgam, or cement as desired.

The papers of Drs. Smith and Patterson were then declared open for discussion.

Dr. GEO. J. FRIEDRICHS, New Orleans, understood Dr. Smith to argue that a dead tooth—that is, a tooth in which the pulp was dead—is longer-lived than one with a live pulp. That is not in accord with the speaker's experience and observation of forty-three or forty-four years, which is that when the pulp is gone the duration of the usefulness of the tooth is limited; but as long as the pulp is left to do its work, the tooth will last. He has seen teeth with the pulps alive worn down to the gums. The teeth were intended to last a lifetime, and in many cases they do. He could not see where the pulp has any connection with pyorrhea alveolaris. If it has, why do we find cases where only one tooth in the mouth is affected, and when that tooth is extracted not another one is affected? If the pulp really was the cause, everybody would have pyorrhea alveolaris. There are two marked periods in the diseases of the teeth—in youth before they are fully matured, and in old age when senile decay sets in. In the latter case there is a want of proper nourishment generally, and the teeth and their pulps suffer with the rest of the body.

Dr. H. J. MCKELLOPS, St. Louis, thought the subject of the care of young teeth of very great importance. Of the children in the public schools, the parents of more than one-half are well able to see to it that their teeth are taken care of. The saving of the pulp is a very important matter. In the case of a child having a small decay in the first permanent molar, you should never use amalgam or gold for filling. You must get the confidence of children, and learn to handle them so as to accomplish the most good, and you cannot do this with amalgam or gold. If you put in oxyphosphate till they are fourteen years of age, watching the tooth and renewing the filling as it needs it, the tooth will be perfectly preserved; if properly done, he would defy any man to find decay. Then you can commence your good work with gold. He wanted to call attention to platinum and gold as one of the best materials for permanent fillings that can be used; the color of the tooth can be approximated, and no power of the jaws can wear out such a filling. The use of this material is not growing as it should. It requires more skill, but the work which can be done with it is something to be proud of.

In these cases shown by Dr. Patterson there is something lacking, something behind the appearances which has not been studied out,—

syphilis perhaps. The teeth look rotten to the core. One of the great needs is to keep the mouth clean. Referring to the method of pulp-protection advocated by Dr. Patterson, Dr. McKellops said that he had used cylinder fillings—soft gold—more than forty years ago, but he had never put in an amalgam filling. As a person grows old, we know that the pulp recedes, but that is not a source of danger. The speaker is of the opinion that in ninety per cent. of the cases referred to in the paper, the cause is in the secretions of the mouth. In such cavities as have been referred to in the papers, if you place a little iodoform and glycerol over the pulp, covering that with asbestos paper and that again with oxyphosphate, after the cement has set, you can put in a gold filling of any kind, and you will never cause any pulp-irritation. This is an idea of Dr. Will Taft's, and it bears the test of actual practice.

Dr. J. TAFT, Cincinnati. With regard to the function and value of the pulp, the position taken by Dr. Smith in his paper is correct, so far as it refers to the teeth of young people. During the period of growth and development it is a necessity, the source of nourishment, without which the tooth would not develop. But how about it after this has been accomplished? Is it of any value after that? Were it not, nature would have made provision for its removal. But does the tooth need nourishment after the individual has reached twenty-five years of age? When is perfect calcification reached? The time varies, in some it is later than others. Some teeth are not perfectly calcified until thirty or thirty-five years of age, remaining to this time in a comparatively defective condition. After this they get denser and denser, but never after the pulp is destroyed. The vital constituents of dentine must have support, and deterioration begins at once when the supply of nourishment is cut off, though disintegration does not begin at once. When the pulp is destroyed the process of nutrition is destroyed, and to every close observer it is plain that after the pulp is devitalized there is a gradual breaking down of the hard tissues of the tooth without the ordinary process of decay, simply by deterioration of the structures, which operates upon the organic constituents, and not perhaps upon the inorganic; so that after a while portions may be readily broken off. This is especially true of enamel at points where there is a thin edge or an exposed border; and even where there is not, its weakened condition makes it readily break away.

If this be true of the enamel it is more true of dentine, which has a larger proportion of organic material. He recalled the case of a first permanent molar, which had lost its pulp and had a large cavity running through from front to back. Dr. Atkinson operated upon it, filling the pulp-chamber and root-canals, and the large cavity of decay upon the crown. After the operation was completed, he said it would last a lifetime. Did it? It went along for eighteen years, and then the whole inner wall broke down, not from the ordinary decay, for it was only slightly decalcified, but from changes in the organic material, rendering it unable to withstand the forces of mastication. The filling remained, and within a year afterward the other side of the tooth broke down in the same way, showing that there was a loss of strength in the tooth that was fatal to it, although it did not finally fail until after long years.

Dr. Taft was glad to hear the references in Dr. Smith's paper to the value of use to the teeth. We all know how to use teeth, but how many of us systematically urge upon our patients the thorough use of the teeth in mastication? He had often asked the question of dentists, and it was very rarely that they answered that they did urge their patients to masticate their food thoroughly. Persons who do masticate their food thoroughly always have better teeth than those who do not; they have less dyspepsia, and a better condition of the tissues throughout the body to resist disease. He had taken considerable interest especially in watching dentists masticate their food, and it was uncommon to see even them perform the act properly. Right here in this village, since this meeting was begun, he had seen them make a snap or two of the jaws upon their food and then swallow it. The teeth of those who masticate thoroughly are more firm, and the gums and attachments are firmer, than if they are defectively used; and he verily believed that if dentists could thoroughly impress every patient with the necessity for forming the habit of masticating the food properly, they would have done one of the highest services to mankind in their power. This habit is a prophylactic of the highest value. It is important to commence the practice of thorough mastication early. It ought to be taught to the child, and great good would be done by such teaching, as the habit, once formed, would be likely to last through life. In concluding, Dr. Taft adjured his brethren to note the teeth of those who do and those who do not masticate their food thoroughly, as their patients come to them, for proof of his assertion.

(To be continued.)

## MINNESOTA STATE DENTAL ASSOCIATION.

THE twelfth annual meeting of the Minnesota State Dental Association was held in the Ryan Block, St. Paul, September 11, 12, and 13, 1895.

A good program was given, and it was entirely carried out. The exhibits were very complete. The attendance was large; twenty-five new members joined during the session.

The following are the officers for the coming year: Dr. E. B. Weeks, Litchfield, president; Dr. W. D. James, Tracy, vice-president; Dr. H. L. Cruttenden, Northfield, secretary; Dr. H. M. Reid, Minneapolis, treasurer; Dr. Claude Kremer, Minneapolis, chairman executive committee; Dr. O. A. Weiss, Minneapolis, master of clinics.

The next annual meeting will be held in Winona.

H. L. CRUTTENDEN, *Secretary*,
Northfield, Minn.

## MASSACHUSETTS DENTAL SOCIETY.

THE following is a list of the officers of the Massachusetts Dental Society for the ensuing year: George A. Maxfield, D.D.S., Holyoke, president; Waldo E. Boardman, D.M.D., Boston, first vice-president; Harry S. Draper, D.D.S., Boston, second vice-president; Edgar O. Kinsman, D.D.S., Cambridge, secretary; Edward Page, M.D., D.M.D., Charlestown District, treasurer; Thomas W. Clements, D.D.S., Brookline, librarian; Joseph T. Paul, D.M.D., Boston, editor.

The state and society have been divided up into district societies, with officers governing the same. The districts are as follows: North and South Metropolitan, Northeastern, Southeastern, Central, Valley, and Western District Dental Societies.

EDGAR O. KINSMAN, D.D.S., *Secretary*,
15 Brattle square, Cambridge, Mass.

# DENTAL SOCIETY ANNOUNCEMENTS.

## REPORT OF TREASURER OF WORLD'S COLUMBIAN DENTAL CONGRESS, IN FULL FROM MARCH 23, 1891, TO JULY 23, 1895.

*Receipts.*

| | |
|---|---|
| American Dental Association | $1000.00 |
| Illinois State Dental Society | 321.00 |
| Iowa State Dental Society | 100.00 |
| Southern Dental Association | 200.00 |
| Washington City Dental Soc. | 50.00 |
| Alabama | 130 00 |
| Arizona | 20.00 |
| Arkansas | 20.00 |
| Austria | 10.00 |
| California | 548.00 |
| Canada | 20.00 |
| Connecticut | 220.00 |
| China | 30 00 |
| Colorado | 40.00 |
| Chili | 10.00 |
| Cuba | 10.00 |
| Delaware | 50.00 |
| District of Columbia | 190.00 |
| England | 50.00 |
| France | 100.00 |
| Florida | 20.00 |
| Georgia | 125.00 |
| Germany | 10.00 |
| Hawaiian Islands | 40.00 |
| Illinois | 3802.00 |
| Iowa | 460.00 |
| Indiana | 355.00 |
| Italy | 10.00 |
| Kentucky | 120.00 |
| Kansas | 130.00 |
| Louisiana | 60.00 |
| Maryland | 250.00 |
| Massachusetts | 395.35 |
| Mississippi | 40.00 |
| Michigan | $245.00 |
| Mexico | 20.00 |
| Maine | 190.00 |
| Minnesota | 405.00 |
| Montana | 10.00 |
| Missouri | 715.00 |
| Miscellaneous | 11.70 |
| Nebraska | 180.00 |
| New Jersey | 477.50 |
| New York | 1515.30 |
| North Carolina | 210.25 |
| New South Wales | 30.00 |
| North Dakota | 40.00 |
| New Hampshire | 10.00 |
| Ohio | 620.00 |
| Oregon | 20.00 |
| Pennsylvania | 840.30 |
| Paraguay | 20.00 |
| Rhode Island | 25.00 |
| Russia | 30.00 |
| South Dakota | 10.00 |
| South Carolina | 130.00 |
| Scotland | 20.15 |
| Switzerland | 20.00 |
| South America | 10.00 |
| Spain | 20.00 |
| Tennessee | 290.00 |
| Texas | 170.00 |
| Vermont | 120.00 |
| Virginia | 100.00 |
| Washington | 80.00 |
| West Virginia | 10.00 |
| Wisconsin | 150.00 |
| Amer. Coll. of Dental Surg. | 10.00 |

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|---|---|
| Baltimore College | $10.00 |
| Chicago College | 10.00 |
| Columbia University | 10.00 |
| Louisville Dental College | 20.00 |
| New York Dental College | 10.00 |
| Ohio Dental College | 10.00 |
| University of Buffalo | 10.00 |
| University of California | 10.00 |
| University of Minnesota | 10.00 |
| University of West'n Reserve | 10.00 |
| Wilmington Dental Mfg. Co. | $40.00 |
| Philadelphia College | 10.00 |
| | $15,851.55 |
| Amount received from Columbia National Bank | 286.06 |
| Donations of Executive Committee | 3600.00 |
| | $19,737.61 |

*Disbursements.*

| | |
|---|---|
| General Finance Committee, L. D. Shepard | $926.25 |
| Executive Committee, Secretary's Expenses | 3018.84 |
| Treasurer's Expenses | 583.59 |
| Treasurer's Bond | 100.00 |
| Secretary-General's Expenses | 1299.48 |
| State Conference Committee, J. Taft | 218.87 |
| Registration Committee, Fred. A. Levy (per G. C. Brown) | 34.00 |
| Invitation Committee, W. C. Barrett | 16.95 |
| Clinics Committee, C. F. W. Bödecker and S. H. Guilford | 80.35 |
| Biology Committee, R. R. Andrews | 18.15 |
| Nomenclature Committee, G. V. Black | 31.00 |
| History Committee, J. Taft | 1523.57 |
| Membership Committee, E. Noyes | 13.50 |
| Publication of Transactions Committee, A. W. Harlan | 4529.95 |
| Donations by Executive Committee, Traveling Expenses | 3600.00 |
| Woman's Department | 307.00 |
| S. S. White Dental Manufacturing Company | 121.80 |
| Medals | 720.00 |
| Buttons and Badges | 257.63 |
| Club House | 1530.00 |
| Banquet—Deficit | 274.60 |
| Refunded Memberships | 50.00 |
| Exchange | 6.36 |
| | $19,261.89 |
| Paid by Columbia National Bank | 286.06 |
| Unpaid by Columbia National Bank | 127.09 |
| | $19,675.04 |
| Balance, July 23, 1895, in Merchants' Loan and Trust Co. Bank | 62.57 |
| | $19,737.61 |

JOHN S. MARSHALL, *Treasurer.*

## NEW YORK BOARD OF DENTAL EXAMINERS.

THE first Board of State Dental Examiners appointed by the Regents is as follows: Dr. William Carr, New York; Dr. William Jarvie, Brooklyn; Dr. E. C. Baxter, Albany; Dr. W. H. Colgrove, Johnstown; Dr. S. B. Palmer, Syracuse; Dr. A. M. Holmes, Morrisville; Dr. Frank French, Rochester; and Dr. A. P. Southwick, Buffalo.

## MASSACHUSETTS BOARD OF REGISTRATION IN DENTISTRY.

A MEETING of the Massachusetts Board of Registration in Dentistry, for the examination of candidates, will be held in Boston, Monday, December 9, 1895, at 10 A.M., at the United States Hotel.

E. V. McLEOD, D.D.S., *Secretary*,
New Bedford, Mass.

# EDITORIAL.

## A SUGGESTION.

THOSE who have studied the motive forces which have elevated the standards of American dentistry will unhesitatingly admit that no other factors have operated so potently toward the end under consideration as the organized efforts of the National Association of Dental Faculties and the National Association of Dental Examiners. These bodies have each had the same ultimate object, notwithstanding the fact that they have worked by different methods and approached the issue from diverse points. But as in mechanics the operation of two forces moving at right angles results in a mean straight line of progression, so have the judicial and governmental factors of these organizations resulted in an impulse which, more than anything else, has rapidly forced the educational status of dentistry to a higher and greatly-improved plane. This has not been accomplished without friction which, at times, has threatened disaster ; but, fortunately, the wiser counsels have prevailed, and the common object for which both bodies were created has been kept in view, until strength and harmony are assured. Both associations were at the first badly handicapped by the lack of legal backing, growing out of and prevented by the separate autonomy of the states represented in their membership. This lack still exists, and probably always will ; but it is no longer a desideratum, as the need for it has been supplanted by a force, in the shape of a strong moral sentiment in their favor, which in its practical operation is of greater power than that of a legal enactment, though it were many times multiplied.

The strength of this moral force is a real one, the magnitude and efficacy of which has had ample demonstration. The stamp of reputability which membership in the Faculties Association confers is not an empty honor, but a feature of vital importance, if not of commercial necessity, to the success of the dental schools of this country.

What was regarded as an impossibility from a legislative point of view,—viz, the creation of a uniform educational standard for the colleges,—is being gradually achieved through the moral force of the Faculties Association. The axiom that if the dental profession is determined to secure interstate recognition of licensees it must be ontent to level downward rather than upward, must hold true so long as we are confronted with the present diversity of state laws regulating the standards of qualification for dental practice. But the unification of educational standards must tend to compel uniformity of legislation in the enforcement of the standard, and, therefore, the surest road to ultimate success in this direction is the harmonious and co-operative working of the Faculties and Examiners Associations along the lines which they have already projected.

There is one feature of the work of these bodies which should not be overlooked, and their duty in that regard shirked or avoided,—viz, the enforcement in the spirit and in the letter of the regulations which they have themselves formulated.

Thus far the rules and regulations of the Faculties Association have borne more directly upon the length of the college course, the length of terms, preliminary qualifications of students, scope of the curriculum, selection of text-books, and kindred problems.

Recently the pedagogical feature of the dental educational problem has excited greater interest, and is receiving more attention. The importance of the technic 'system of training has commanded a due recognition of its merits, and has opened up the whole question of dental educational methods for careful consideration. That the immense importance of this phase of their work is appreciated by the Faculties Association is apparent from the tendency which was manifested during the late meeting at Asbury Park to effect a coalition between the National School of Dental Technics and the National Association of Dental Faculties. Another evidence of the same fact is the following, which we quote from our report of the Faculties Association meeting in our previous issue,—viz, "A resolution was adopted requiring each college holding membership in the association to file with the secretary sixty days before the next meeting a detailed statement of its equipment and facilities for teaching ; all new applicants to file a similar statement with their applications. The secretary was instructed to have blank forms printed for the purpose and forwarded to the various schools."

The value and importance of the foregoing rule should be conceded at once, and the principle which it involves should be further extended. The creation of a standard naturally involves the implication that the provisions of the standard shall be literally carried into effect. Just as we have, with respect to the common law, the legislative and executive departments, which are mutually dependent and co-operative, so in the present case ample and efficient provision for carrying into effect the regulations of the Faculties Association should be made. To that end, it would seem desirable to invest the National Association of Dental Examiners with authority derived from the Faculties Association, to examine into the educational equipment and methods pursued by the colleges in its representation, and have the committees to whom this supervisory work was intrusted furnish detailed reports to the Examiners, who, when that body found reason so to do, could in a courteous and friendly way call the attention of the Faculties Association to any case of dereliction which, in their judgment, required the action of the latter.

No doubt a proposition to invest the Examiners with supervisory power of this character would be met with some opposition ; but in the nature of the case it may be asked what reasonable grounds for objection to it can be set up.

The issues involved in the work of these two associations are the most vitally important of any which concern the dental profession. Such being the case, business and not sentimental methods should govern their actions. The presumption is that when a college secures membership in the National Association of Dental Faculties the future conduct of the institution is in thorough accord with the rules and regulations laid down by that body. But does any one know that in all cases these regulations are obeyed in the spirit and letter? What means are pursued by the Faculties Association to secure official information as to the faithfulness with which their rulings are carried into effect?

If the statements of the parties in interest are accepted to that end, then the executive phase of the work of the association is conducted upon a sentimental basis which is liable to lead to disastrous consequences. The situation is quite analogous to that of a banking house or corporation that relies implicitly upon the chaste honor of trusted employês and deems it an unnecessary impeachment of that honor to audit their accounts.

This system of business sentimentality has been tried and found wanting.

An honest man never objects to producing the vouchers for his acts, though his character may be as white as the doe of Rylestone. And in this view the strong probability is that no college faculty that was conscientiously living up to the rulings of the Faculties Association would interpose the slightest objection to an official visitation of inspection by a committee authorized by that body. On the contrary, such a visitation would doubtless be welcomed, as it would afford an opportunity to secure official recognition of the perfection of the equipment, the educational system employed, and the standard of excellence maintained, thus adding strength to the institutions that deserved it. The effect upon schools which fall below the standard could not be otherwise than beneficial, as they would be compelled either to raise their standards or drop out of the race.

# BIBLIOGRAPHICAL.

Catalogue of the Surgeon-General's Office, U. S. Army —Authors and Subjects. Vol. XVI. W to Zythus.

This volume marks the close of the work on the Index Catalogue. In these sixteen volumes are contained author titles of nearly ninety thousand volumes and over one hundred and fifty thousand pamphlets. It is announced that the manuscript of the second series of the Index Catalogue, including all the titles of books and articles received too late for insertion in the first series, has been prepared and will probably make five printed volumes of the same size and style as those of the first series. The Library of the Surgeon-General's Office now contains nearly one hundred and twenty thousand books and over one hundred and ninety-one thousand pamphlets, practically all of which have been collected in the last thirty-five years.

The task of indexing and cataloguing this vast amount of material is one which has been herculean in character, and places all whose work is related to study in this field under lasting obligation to Dr. Billings and his able collaborators.

## Books Received.

Formulaire de Médecine et de Chirurgie Dentaires. Maladies et Hygiène de la Bouche et des Dents. Par Noël H. Thomson, D.E.D.P. Paris, J. B. Baillière et Fils, 1895.

Dental Materia Medica and Therapeutics. By James Stocken, L.D.S. Eng. Fourth edition. London, H. K. Lewis, 1895.

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# OBITUARY.

## DR. JAMES E. GARRETSON.

James Edmund Garretson, A.M., M.D., D.D.S., professor of anatomy and surgery in the Philadelphia Dental College and dean of that institution, died at his home in Lansdowne, Pa., on the evening of Saturday, October 26, 1895.

Dr. Garretson was born in Wilmington, Delaware, October 18, 1828, and commenced the study of dentistry with Dr. Thacher, of Wilmington, in 1850. He began practice in the neighborhood of Woodbury, N. J., and later came to Philadelphia, where he entered as a student in the Philadelphia College of Dental Surgery, the progenitor of the present Pennsylvania College of Dental Surgery. He received his degree in dentistry on February 29, 1856, and entered upon the practice of his profession in Philadelphia. Among his classmates was his brother-in-law, Dr. J. Foster Flagg, for many years his colleague in the faculty of the Philadelphia Dental College.

He began the study of medicine at the University of Pennsylvania, graduating from that institution in 1859. The same year he was married to Beu h, a daughter of George Craft, of Upper Greenwich, N. J. At the organization of the Philadelphia Dental College in 1862, Dr. Garretson became a member of the faculty as professor of pathology and therapeutics, but before delivering his course of lectures he resigned to accept the position made vacant by resignation of the late Professor D. Hayes Agnew in the Philadelphia School of Anatomy, in which school Dr. Garretson had been a demonstrator for five years. He continued in charge of the school until 1864, when he gave up that position and entered the Philadelphia Dental College as professor of anatomy and surgery. During the war of the rebellion Dr. Garretson for a time was in active military hospital service. In 1869 he was appointed oral surgeon to the hospital of the University of Pennsylvania. In 1880 he became dean of the Philadelphia Dental College, which position he faithfully and acceptably filled until his death.

In the especial field of his activities Dr. Garretson filled a unique place. He was the pioneer in a new department of surgery, and the creator of its technique. He brought to the practice of his life-work the skill and manual dexterity of the trained dentist, to which was added the broad culture and intimate knowledge of his subject required by the educated surgeon. With this educational equipment grafted upon his rich natural endowment of attractive characteristics, a combination resulted which easily accounts for his phenomenal success and wide reputation as a surgeon and as a teacher.

Broadly speaking, Dr. Garretson may be said to be a striking example of the self-made man. His love for his work, his faith in and respect for the possibilities of development in dentistry, and his ambition to secure for it the status and recognition it deserved, have borne abundant fruit in the example of success which he has left as a heritage to his profession.

He realized the crudity which characterized the method of performance of the earlier operations done upon the head, face, and jaws; he saw that the special training and many of the operative methods of the dentist were, with suitable modification, directly applicable to surgery within his selected territory. Grasping this great principle and putting it to thorough practical test, he soon found that he had struck the keynote to success. The whole complexion of his operations, whether viewed as to their technique or as to the character of the results, differed essentially from the work done by any of his predecessors and the majority of his contemporaries. His work was distinctly conservative in character. He kept in view the importance of the cosmetic feature of his results, and as a consequence his operations were designed and done with a distinct purpose to avoid to the utmost extent permanent mutilation.

It was his custom as far as possible in operations upon the jaws to perform them within the mouth in order to avoid external incisions, and he carried the development of this principle to the extent that he frequently operated for the removal of the entire superior maxilla through the mouth without external incision. His conservatism was further manifested in respect to the several tissues of the oral cavity, it being a cardinal principle with him never to remove healthy tissue that might in any degree help to bring about a normal restoration of function within the territory of operation. His operations upon the inferior maxilla always involved this feature as far as conditions permitted. Hence it was his custom to leave a thin basilar rim of bone and periosteum for inducing the reformation of a maxillary ridge to be utilized as a base of support for an artificial denture.

His success in operations of this character is in strong contrast with the results shown by the general surgeon who lacks the familiarity with dental methods and requirements possessed by Dr. Garretson.

The record of his results would be incomplete without a reference to his use of the dento-surgical engine in his operative procedures. That he should at once appreciate the applicability of the engine to bone operations was the natural consequence of his dental training. He was among the earliest, if not the first, to successfully make use of this very important and, in many operations, essential aid. He kept it in constant service, and its efficiency is everywhere reflected in the superior results attained by him in his operations, as well as in the performance of certain operations—especially those within the brain-case—that would be impossible of performance without it. The practical development of the surgical uses of the engine is inseparably connected with the record of his surgical work.

The permanent record of his surgical work is embodied in his greatest literary work, the "System of Oral Surgery." This book has passed through six editions, the first appearing in 1869 and the last in 1895.

It is in the last edition of this great work that the culmination of his endeavor to place dental surgery upon a parity with the officially-recognized medical specialties is seen. The former editions exhibit the gradual evolution of a professional condition which began in toleration and has since grown into a just recognition.

Dr. Garretson's intellectual qualities were strongly characteristic. His pronounced penchant for philosophical and metaphysical study was one of the determining features of his life. This love for philosophical study manifested itself strongly in his writings, and in his lectures to his students. He possessed wonderful insight into the profounder psychic problems of life, and great facility in their interpretation and portrayal to others. His fluency as a speaker, his intense appreciation of the divinity which doth hedge a man, his kindliness and sympathetic quality, often gave to his formal lectures and addresses an oratorical quality of high grade.

Dr. Garretson was a contributor not only to the literature of his profession, but to general literature as well. The earliest of his writings, so far as we have been able to trace, are a contribution upon "Dental Hygiene," and one upon the "Ether Question," published in the *Dental News Letter* in 1855. His writings consisted of a number of separate book publications, as well as of contributions to periodical literature. There have appeared in the DENTAL COSMOS upward of one hundred articles from his pen, beside a large number of unsigned communications published as Hints and Queries.

Apart from his "System of Oral Surgery," he has published works as follows: "Brushland," "Hours with John Darby," "Thinking and Thinkers," "Odd Hours of a Physician," "Nineteenth Century Sense," and "Man and His World." These were written under the *nom de plume* of "John Darby."

Dr. Garretson possessed to a marked degree attributes of simplicity and guilelessness. He had a childlike faith in the honesty of mankind; years never taught him even the shadow of a distrust or suspicion of his fellowman, which might have spared him much of the care and anxiety which clouded his last days.

The cause of his death was stated by his physician to be enteritis; many of his friends, however, believe that his death was hastened, if not induced, by mental anxiety caused by the difficulties resulting in the recent separation between the Philadelphia Dental College and the Medico-Chirurgical College. His death was preceded by profound nervous exhaustion, which increased to the end.

In accordance with his earnestly expressed wish, his remains were incinerated at the Germantown Crematory, on Wednesday, October 30, and the ashes subsequently interred at the Friends' burying ground in Upper Darby —Dr. Garretson being a member of that faith.

The surviving members of his family are his widow and two daughters.

## DR. DWIGHT W. LEACH.

DR. DWIGHT WELLS LEACH, of Boston, was killed in attempting to board a moving train at South Braintree, Mass., September 2, 1895. He was in the fifty-ninth year of his age.

Dr. Leach was born at North Leverett, Mass., December 24, 1836. His dental pupilage was passed with Dr. Charles Leach, at Middleborough, Mass., and in the fall of 1858 he entered the practice of dentistry at Abington. In 1859 he located at Randolph, Mass., and several years later, opened a branch office in Boston, where he was permanently settled in practice at the time of his death, though retaining his residence at Randolph. He was highly respected for his professional attainments and genial disposition. He was a member and sometime treasurer of the Old Colony Dental Association, and also a member of the Massachusetts Dental Society.

In 1861 Dr. Leach was married at Kingston, Mass., to Elizabeth Sprague Ring, who survives him with two grown daughters.

## DR. HOMER L. FITTS.

DIED, at Worcester, Mass., July 18, 1895, of myelitis, HOMER L. FITTS, D.D.S., in the fortieth year of his age.

Dr. Fitts was born at Worcester, Mass., November 19, 1856. He studied dentistry with Dr. I. J. Wetherbee, of Boston, and graduated at the Boston Dental College in 1877. He then entered practice at Worcester, where he established a reputation for unusual skill as an operator, and met with decided success. Ill health compelled his retirement from practice about three years ago.

Dr. Fitts was possessed of rare grace and kindliness of manner, which won him many sincere admirers and ardent friends. He bore a long illness and several recent family bereavements with patience and fortitude. He was unmarried.

## DR. W. A. DICK.

DIED, at Colusa, Cal., September 6, 1895, of heart-failure, W. A. DICK, D.D.S., in the twenty-sixth year of his age.

Dr. Dick was born in Kentucky, but many years ago went with his parents to Woodland, Cal. He attended the public schools of that city, and then entered Hesperian College, of which institution he was a graduate. Subsequently he came East and matriculated at the Baltimore College of Dental Surgery, from which he graduated in 1891. He then returned to Woodland

and associated himself with his father in the practice of dentistry. In 1892 he moved to Colusa and opened an office of his own, where he rapidly built up a fine practice.

Though young, Dr. Dick had made many friends by his genial disposition, courteous manners, and manly principles. He was a prominent membe of the Christian church, in which he took an active part; was industrious and ever ready to aid in whatever concerned the welfare of the community. In September, 1894, he married Miss Eva Simpson, who survives him. The remains were taken to Woodland for interment.

## DR. HENRY NEWINGTON.

DIED, in New York City, October 11, 1895, of paralysis of the heart, HENRY NEWINGTON, D.D.S., in the seventy-fifth year of his age.

Dr. Newington was born at Sussex, England, February 5, 1821. When ten years of age he came to this country. He was educated in Canada, and subsequently entered the Ohio College of Dental Surgery, whence he was graduated with the class of 1865. After practicing in St. Louis for about twenty years he went to New York City, where he had been in practice ever since. He was sometime president of the St. Louis Dental Association, and was also a member of several medical societies, and of the Masonic order.

About forty years ago, Dr. Newington was married to Miss Jane Harriet Cassan, the daughter of Captain Cassan of the Ninety-third Highlanders, British army. She survives him, with two children. The remains were interred in Woodlawn Cemetery.

## DR. CUSHING WEBBER.

DIED, on Tuesday, September 3, 1895, at his summer residence, Bayside (Hull), Mass., of gastric ulcer, Dr. CUSHING WEBBER, in the seventy-second year of his age.

Dr. Webber for over fifty years had been a prominent practitioner of dentistry in Boston, Mass. He was born at Boothbay, Maine, March 14, 1824, commencing practice in Massachusetts in 1844.

He enjoyed an enviable reputation as a practitioner of exceptional skill, and was the author of numerous useful inventions. He held many offices of trust, in which, as also in private life, his conscientiousness, his charities, and universal kindness were proverbial.

His life was above reproach. A philosopher, a Christian in the broadest sense, he endeared to him all who came within his sphere. He leaves a widow and two sons.

Dr. H. Mason Perkins, formerly of Shanghai, China, joined Dr. Webber in partnership a year ago last July.

## RESOLUTIONS OF RESPECT.

THE American Academy of Dental Science has recently adopted the following resolutions of respect to two of its deceased members:

By the death of Thomas H. Chandler, A.B., D.M.D., the American Academy of Dental Science has lost a fellow of rare worth, one who had the respect of the profession at home and abroad, and the love of all who knew him intimately. He became a fellow of this society in 1870, and was its president in 1881. Having taken a collegiate course before studying the profession of dentistry, he was well calculated to take the high stand which he has always maintained in regard to dental education. Believing, as he did, that general culture was a better foundation upon which to build a dental education than was the technical training of a medical course, he is to be honored for his efforts to make ours a liberal profession. He was ever ready to assist those who sought his aid, and took pleasure in acquiring knowledge, that he might, in turn, impart it to others.

His genial and kindly disposition made his association with us peculiarly pleasant. His high ideal of what the dentist should be is an example worthy of our emulation. His dignified and courtly bearing, his scholarship, and his devotion to his work did much to elevate dentistry to its present honorable position. His aim has been high; his achievements great; his record honorable; and dentistry will forever bear the impress of his life. Be it therefore

*Resolved*, That in the death of Professor Chandler the fellows of this academy feel that they have sustained a great and personal loss, and the dental profession that of one of its most eminent members;

That to his family we extend most sincere and heartfelt sympathy;

That a page of our records be set aside in honor and affection to his memory.

[Signed by C. P. Wilson, Dwight M. Clapp, R. R. Andrews, Committee.]

*Resolved*, That the American Academy of Dental Science deeply regrets the loss, by death, of Elisha G. Tucker, M.D., an honorary member, and one of its original founders;

That in a professional life, begun with the soundest known foundation, and carried through more than half a century with intelligent consistency, he has left a record of perseverance in principle worthy of remembrance;

That we shall greatly miss his venerable and genial companionship, and we would express our sympathetic condolence for the family of our departed member.

[Signed by Jacob L. Williams, Frederick N. Seabury, A. F. Preston, Committee.]

# PERISCOPE.

"THE WAY TO REFORM IS TO REFORM."—In dental education we are brought face to face with many theories that are as different as the men who hold those theories. Different capabilities and different opportunities for acquiring knowledge must invariably present men with diverse views, and who are entirely honest in their advocacy.

This being true, it seems very fortunate that in dental education there are still many cardinal points which are held in common by nearly all who desire the betterment of our profession. One of these cardinal beliefs is, that the dental profession will most rapidly improve by guarding the portals at the dental colleges, and see that none enter but those who are by nature and education fitted to ornament the profession. Upon this point all agree. None but the born anarchist in the profession can object to the proposition.

And yet, while this is true, what do we see? When an earnest effort is made to do something more than talk, to reform by reforming, we find that the opinions of some in the profession have strings attached. They are willing to talk, but not to act.

For years the National Association of Dental Faculties has striven to add needed reforms in the requirements for admission to colleges belonging to that association, and while upon minor points the association has been successful, yet when the more important matters have been broached, such as a radical improvement in preliminary education, it has been met with a storm of opposition which has resulted in defeat for those who favored radical and reasonable steps in advance.

As proof of this statement we point to the fact that a resolution was introduced at the Faculties Association meeting three years ago, requiring of applicants a reasonable knowledge of physics and Latin. When the resolution came up for action at a subsequent meeting, and efforts were being made to determine what a reasonable knowledge in these branches (which would benefit the student) would be, a prominent member of the association moved to lay the whole question upon the table. This motion was sustained, and the men who believe "the way to reform is to reform" thus met with defeat.

This is only one instance of the way in which measures designed to carry out the best ideas of progress in dental education are defeated. The men who prominently opposed the advance referred to are connected with universities, and, of all men, should be in the van of progress. Their arguments were something like this: "If you pass such a resolution, you will close the doors of half the dental colleges of the land." "You will prevent many deserving young men, who would make splendid operators, from entering the profession of dentistry." "You are trying to emulate the European idea of making good scientists and poor dentists." These objections were all overheard by the writer.

In the first place, we do not believe any college would suffer financially should the entrance requirements be increased. The student would very readily accommodate himself to the advance, and while it would postpone his entrance to college, yet others, already qualified, would, on account of the profession demanding an advanced standing, be induced to enter the ranks of a body of men who by their action proved their dignity and usefulness. We did not find that the attendance at colleges was lessened when the length of the course was extended to three years, neither would we find the attendance cut off if a reasonable advance in preliminary education were asked.

The second argument, in favor of the poor uneducated boy, scarcely needs answer. The time has passed, that once existed, when it might be humanitarian to take the uneducated, on account of some supposed latent talent or genius, and initiate him into professional work. The profession of dentistry is now overcrowded. There are plenty of educated, gentlemanly young men who will ornament our calling. Then what need to jeopardize possible rapid advance by admitting the uncultivated and unmannerly? We do not deny—nay, we affirm—that many of the brightest men in dentistry came from unpropitious material; yet times have changed, former customs have given way to better civilization and better judgment, and so it is our duty to select the material that will protect the future of our profession. If we do not do this, then, very possibly, it will have no future to deserve protection.

In asking better education are we following the English plan, the European plan? I sincerely trust that we are, because I believe the plan has many good points. The American dentist, who is all practical, often scoffs at his confrère over the water because he is all science and theory, with little of our boasted manipulative ability. It is true that even the intelligent average European dentist is away below the American in the handicraft of dentistry. But he is not going to remain there; he is rapidly getting into the American way, and then he will have both education and dexterity, and unless we strive for the educational requirement we will be second best in future generations.

"The way to reform is to reform." Then let us advance the requirements for admission to our colleges.—*Western Dental Journal*, *editorial.*

FORMALIN.—Formalin is a solution of formaldehyd (methylaldehyd) $CH_2O$, or H-COH in water. The water absorbs forty per cent. of the gas.

Some months ago formalin attracted my attention, in consequence of the excellent qualities it possesses as a hardening fluid, and the idea occurred to me that advantage might be taken of this fact for dental practice. According to M. Snedel, if a finely-dissolved solution be sprayed on walls, wall-paper, and furniture, its disinfecting power extends to a good depth, destroying pathogenic bacteria and their germs. Experiments have been made by several investigators with solutions of one per cent. to ten per cent. in strength. A one per cent. solution is fully reliable as regards making wounds and instruments aseptic. Silicious earth absorbs formaldehyd, and, little by little, gives it off again, so may be used in the surgery and in the instrument cupboard.

A strong solution of formalin, thirty per cent., causes pain to the epidermis, the mucous membrane of the mouth, and in deep cavities, so that in the first case mentioned the epidermis hardens, and is afterward thrown off, while in the two latter cases no inconvenience at all arises. A solution of one per thousand can be used for rinsing the mouth and throat.

When treating partially inflamed pulps I find that a one to five per cent. solution gives a satisfactory result, as, besides being an antiseptic, formalin also acts as an astringent.

A filling can at once be placed above a cauterized and amputated pulp which has been treated with a thirty per cent. solution of formalin, provided a piece of carbonized wadding, dipped in the solution, be applied to the roots of the pulp. I have, however, only done this in those cases where the patients needed very rapid treatment, having otherwise inserted an application for one or two days, after which time the procedure just mentioned was undertaken. After being treated with such a solution for twenty-four hours the roots of the pulp are found to be gray and hard, though elastic.

For disinfecting teeth with gangrenous pulps, root-canals that have been open for a long time, alveolar abscesses, and periosteal inflammations, I have used the same with great success : in root-canals solutions of twenty to thirty per cent., in alveoli or abscess-cavities solutions of one to five per cent., according to the quantity it is possible to use. The pain that may possibly arise when injecting it in the alveolus, or when syringing it, is easily alleviated by cocain.

It may appear that my statements concerning the strength of the solutions in the different cases are not very definite, but this is owing both to the short time, comparatively speaking, that I have been carrying on my investigations—only since last October—and that, as a general rule, I decide the strength of the medicament used according to the special case and circumstances. As formalin has proved to have several qualities which to my knowledge are not combined in any other drug at present at our disposal, my intention in penning these lines is to call attention thereto.—*Dr. G. Forssman, in Brit. Journ. Dental Science.*

# HINTS, QUERIES AND COMMENTS.

Furred Tongue.—The views expressed by observers with respect to the significance of what is commonly known as "furred tongue" are exceedingly numerous. The color, magnitude, extent, and in fact each varying shade of difference in the appearance of the coating upon the dorsum linguæ has had assigned to it a special pathognomonic relation. The constant association of furred tongue with gastric disturbance is a well-recognized fact ; hence it is that when the physician, or in fact the average layman, on examination of the tongue discovers the presence of a furred coating upon it, the diagnosis of a disordered stomach or liver is at once made. There is, however, a wide difference of opinion as to the causal relationship which exists between "furred tongue" and "spoiled stomach ;" the popular idea being that the disordered stomach causes the furred tongue. While it cannot by any means be correctly asserted that this is always an error, there is ample reason for calling it in question, and in some instances at least there is good ground for the belief that the relationship is exactly reversed ; in other words, that the disordered stomach is produced by and dependent upon the mouth condition.

During the general epidemic of grippe which occurred some years ago, the writer had frequent opportunities for observing the oral conditions of patients who suffered from the disease in question. An almost constant phenomenon which presented itself at the inception of the disorder and persisted throughout its course, was a heavy white coating upon the dorsum of the tongue. The tongue appearance was so constant and characteristic that the observation of this grippal tongue afforded an easy means of diagnosis in the recognition of patients who had been or were about to be attacked by this disease. A somewhat careful study of the phenomena presented by patients in passing through the cycle of the disease compelled the belief that it was zymotic in character, and that the port of entry for the specific organism was generally the oral cavity. In two cases, however, the nasal passages were involved; for an examination revealed a similar white, frosty-looking condition of the mucous membrane lining the nose and naso-pharynx. Immediately following the installation of the specific germ in the oral cavity, local inflammations occurred, involving the tongue, gingival margins, the velum and uvula, pharynx and tonsils. Following this, marked gastric disturbance ensued, characterized by loss of appetite, gastralgia, and the phenomena of gastric catarrh. Later, in some cases,—especially in children,—intestinal irritation of a catarrhal character supervened, characterized by watery passages with, frequently, hemorrhagic symptoms in the shape of bloody stools. These gastro-intestinal phenomena were intercurrent with the general systemic outbreaks, attended with pyrexia and the characteristic nervous phenomena. The cycle of symptoms here outlined plainly indicated the progressive infection of the whole gastro-intestinal tract, from the mouth downward. Hence, in these cases, the desirability of thorough mouth sterilization at once suggested itself. To remove the deposit upon the tongue, a number of expedients were resorted to,—hydrogen dioxid solutions, diluted Labarraque's solution, sublimate 1–1000, boracic acid, and tincture of iodin. The application of these remedies was in each case preceded by a thorough mechanical treatment of the tongue by means of a suitable scraping instrument, to remove as much of the deposit in this way as possible. While these efforts were invariably productive of good, —especially noticeable in their effect in preventing relapses of the disorder,— still the tenacious adherence of the deposit rendered its removal extremely difficult, and it was only through the utmost care and vigilance that the growth could be prevented from rapidly reforming, as none of the drugs used seemed to have the power to completely remove the deposit by a single treatment.

Subsequent experimentation in this connection, in trying to remove the furred coating from the tongue in cases ordinarily regarded as due to a bilious or disordered stomach, led to the use of phénol sodique, with most satisfactory results.

By seizing the tip of the tongue between the thumb and fingers armed with a napkin, and drawing it well forward, the furred coating can at once be removed by means of an ordinary tooth-brush, which has been first dipped in water and then had sprinkled upon it six or eight drops of phénol sodique. The strongly alkaline character of this application seems to exert a saponifying action upon the deposit, which is thus easily and completely removed at one treatment.

That the modus of infection in the case of grippe is as above outlined, seems to the writer to be beyond question; and further, that many other zymotic diseases—though they may vary considerably in their several local expressions in the oral cavity—invade the general system in an analogous manner. Diphtheria and bronchitis give strong indications of belonging to the class in question, the germs of which have the oral cavity as their port of entry. Hence the extreme importance of systematic and thorough sterilization of the mouth in all such cases; not only as a prophylactic, but as a means of preventing the continuance of the disorder.

The use of phénol sodique, as here indicated, promises most satisfactory results in such cases.—EDWARD C. KIRK.

PURIFICATION OF GUTTA-PERCHA.—The *Zahntechnische Reform* quotes from the *Berlin. Drog. Zeitung* the following method for the purification of gutta-percha:

Dissolve crude gutta-percha in twenty parts of benzol, carbon bisulfid, or chloroform. When solution is complete, a quantity of finely powdered plaster of Paris is added, the whole shaken up and set aside for forty-eight hours. At the end of this time all impurities will have subsided. The clear supernatant liquid is then poured off into another vessel, double the volume of 90° alcohol is added, and the whole well shaken together. The purified gutta-percha separates out as a white mass, which is then collected and dried by exposure to the air until all odor of the solvent has disappeared. The general method is not new, but the addition of plaster of Paris is a novelty which greatly hastens the separation of the impurities and thus shortens the process of purification.

STERILIZATION OF DENTAL INSTRUMENTS.—The thorough and safe sterilization of dental and surgical instruments is a problem which is beset with no little difficulty. Many of our most potent antiseptic agents act detrimentally upon the steel surface, for which reason they must be excluded. High temperatures destroy or modify to a dangerous degree the delicate temper of many instruments, beside which the methods of heat sterilization require, in general, a special apparatus for the purpose, which adds complexity and difficulty to the process.

It has been shown by test and experience that the caustic alkalies, as well as their carbonates, possess marked germicidal properties. One of the most manageable and satisfactory agents of this class is liquor ammon. fort. Instruments soaked for a few minutes in a rather warm aqueous solution of ammonia are most beautifully cleansed thereby, without detriment to their polish or temper. We have no data bearing upon the relative efficacy of ammonia as a germicide, but believe it to be worthy of trial and scientific investigation in this relation.

GOLD CLASPS FOR ARTIFICIAL DENTURES.—In making gold clasps for artificial dentures I have found that in almost every instance the tooth or teeth to which they are attached finally become affected through decay caused by the contact of the metal,—a condition not so much to be expected from rubber clasps, which, however, are not as strong. Metal though, being indispensable, the idea of combining both the strength and protective qualities suggested the idea to me of flowing rubber over the serrated inner surface of the clasp metal.—WM. LOEWENTHAL.

THE Supreme Court of Michigan has recently decided that a dentist is not a surgeon within the meaning of the Michigan statute concerning privileged communications, and therefore not entitled to the protection of that law.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

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## PERTAINING OR APPLICABLE TO DENTISTRY

### ISSUED DURING SEPTEMBER, 1895.

*September 3.*—No. 545,754, to Edward Wishart. Tooth-separator.
" *10.*—No. 546,195, to Warren M. Sharp. Dental mouth-glass.
" *17.*—No. 546,331, to G. A. Johnston and H. M. Carroll. Artificial teeth.
" " No. 546,465, to M. R. Griswold. Press-holder and heater for dental flasks.

THE

# DENTAL COSMOS.

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## ORIGINAL COMMUNICATIONS.

### AMALGAMS AS CHEMICAL COMPOUNDS.

BY HENRY H. BURCHARD, D.D.S., M.D., PHILADELPHIA, PA.

AN opinion or belief, held by apparently not a few, is, that the solution of a solid metal in a mass of one which is molten, is a phenomenon wholly referable for explanation to the domain of physics. This view of the matter assumes that, when heat has produced in any metal that change of molecular condition known as melting, and other metals are added to it, their solution, in turn, occurs according to their positions in the scale of fusibilities. Thus, if to a mass of molten tin several other metals be added, they would dissolve readily or slowly, according as their several melting points were low or high. Bismuth would melt first, lead next, after this zinc, then aluminum, silver, gold, copper, palladium, and platinum ; the only difference in the yielding of the metals, aside from their comparative fusibilities, being due to the specific heat of each. Conversely, the solidification of the mass would take place in the reverse order.

In mercury at ordinary temperatures, say 70° F., we have a metal which is molecularly in the condition of any other metal one-fifth the way toward volatilization.

In this condition, other metals added to it are melted with very marked differences in the degrees of readiness.

Instead of finding the union or solution occur, as it would were the opinion quoted correct, according to the position occupied by the solid metal in the fusibility scale, we find aberrations or exceptions which are only explicable through the laws of chemistry.

There is abundant reason to believe that all molten metals exhibit, in the breaking down of others, similar attractions, and that the solution of one metal in another is governed primarily by the chemical affinities these metals possess for one another. The elevation of temperature, producing fusion of both, is a supplemental factor.

Thus, it has been demonstrated that the strongest affinities of mercury for other metals are for the alkali metals and gold, the next for tin, a direct contradiction of the physical theory of solution. Again, palladium is solved much more readily than platinum, copper than aluminum.

This series of exceptions in itself is sufficient to disprove the physical theory.

All molten metals unquestionably exercise selective affinities for one another.

Amalgams, while exhibiting several distinctive properties, due to the peculiar component mercury, belong to the general class of alloys ; their formation and properties are determined by the general laws governing all alloys. As alloys, they are included in the noted formulation of Matthiessen, and are part of the basis for his general rule.

In many alloys there are present definite chemical compounds, and, as a rule, sub-chemical combinations in addition ; from these down to mixtures in which chemical affinities are very feeble or absent, and the components may separate through differences in gravity. All of these several varieties of compounds may be present in a common mass.

Metallurgic data are in large part made up from wholly empiric observation. Metals of which the several properties are well known singly, when fused together, are found to produce bodies which differ essentially in their properties from the properties of the several metals of which it is composed ; the properties of the individual metals not presaging accurately the results of their combination.

Possibly no worker in metallurgy has failed to note the frequently astounding results produced by these unions of metals.

Were alloys mere mixtures of metals, their properties would be a general average of the peculiarities of all.

A definition of a chemical compound is, "a substance in which the identities of the constituents are lost, the resulting body possessing characteristics differing entirely from those of its several components." In view of some of the data of modern synthetic chemistry, it is possible that this definition would require modification.

With such a definition in view, it will be seen that many of our present alloys are not purely chemical compounds, as the identities of the several metals, though disguised, may not be lost ; in fact, some of them may even be detected by physical means.

Alloys are usually more frangible than their several components. As a class they have a distinctly granular structure, and, as a rule, are less malleable than the metals of which they are made. Their physical features *may be* modified and governed by the predominant metal. In some of the combinations, bodies are formed which bear little or no resemblance to the constituents, either in appearance or properties. Many of these are doubtless true chemical bodies.

During the past year there have appeared two articles dealing with this branch of metallurgy which, in point of effect, will work a revolution in many of our former conceptions.

One of these was an essay read by Dr. E. C. Kirk before the Odontological Society of New York,—"On Some Principles Relating to Amalgams,"—in which these bodies were discussed as chemical compounds. The next is that unique series of articles by Dr. G. V. Black, just published in the Cosmos, on the physical properties of amalgams. No more distinguished work exists in dental literature than this of Dr. Black's. It is a worthy fellow to his contributions in dental pathology and anatomy. No doubt general acquiescence would be given to the opinion that its only rivals are the researches of Miller in oral pathology and those of Dr. Cryer in regional anatomy.

The principles expounded by Dr. Kirk in the essay noted, the writer is convinced, are those which will ultimately receive general indorsement. It was the first time in the history of dental metallurgy that amalgams had been treated from a *purely* scientific basis.

It is proposed to present a short sketch of a parallel study of these two essays.

Dr. Kirk's argument is, essentially, "that amalgams are solutions in mercury of such metals as have an affinity for it. In virtue of this affinity, the several metals, under proper conditions, combine chemically in atomic ratios. The setting of the mass is, theoretically, a crystallization of definite chemical compounds formed between mercury and the several metals. That the solution and combination occur according to the strength of the affinities, which may be weak or comparatively strong. The object to be sought in forming an amalgam is the production of a definite chemical body—a body in which the several elements are united in atomic ratios. All of the affinities being satisfied, there results a more stable body than were the components united in any other ratio." The essay under discussion arrived at these conclusions or opinions by a process of deduction founded upon the general principles of chemistry.

The inductive process is applied to the subject in this essay.

If the reasoning of the present writer be correct, it will be seen that the basal idea is supported by the data of Dr. Black.

It is usually accepted that the affinity of mercury for other metals is a comparatively feeble one. As an illustration of this, Joulé has shown "that many amalgams which contain an equal number of atoms of the component metals may be partly decomposed by subjecting them to great pressure; part of the mercury being forced out, an amalgam containing a larger portion of other metals remaining." It is difficult, however, to completely sever this bond of union. As an example, the writer has repeatedly melted old battery zincs, raising them to a dull red heat, without driving off all the mercury.

"A gold amalgam 1 to 1000 has all the fluid mercury expressed through chamois; the residue treated with dilute nitric acid, at a moderate heat. A solid amalgam is left, $Au_8Hg$, which crystallizes in four-sided prisms, and does not melt even when heated until the mercury volatilizes."*

"A mixture of gold and mercury was heated to a temperature a little above the boiling-point of mercury, and the heat maintained until the weight became constant, and there resulted an amalgam containing 10.3 per cent. of mercury, giving a formula of $Au_9Hg$." (Hiorns.)

Guettier points out that a saturated solution of gold in mercury is $Au_2Hg$, a mass of waxy consistence. Evidently, when the gold exceeds this ratio, there is not a perfect chemical compound, as, for instance, in the $Au_8Hg$ amalgam.

It shows also that the ratio of the components may place an amalgam in the class of mixtures, and yet there may be crystallization of the mass. In some cases where there is an excess of mercury, a definite amalgam crystallizes out the excess of mercury separating. Or mercury may be united in a manner not clearly understood with the alloy metals, a compound which crystallizes, and yet the mercury is in excess. As hereafter stated, it may occupy a position analogous to that of water of crystallization.

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* T. H. Henry, *Philos. Mag.*, vol. ix, p. 468.

The first amalgams for discussion are the binary, made by the addition of mercury to one metal.

A tin amalgam, $SnHg$, is brittle, granular, comparatively soft, and it is said it shrinks greatly in setting. The affinity of mercury for this metal is second in the scale to that for gold. A silver amalgam is made with difficulty at low temperatures ; readily if the metals are heated. One of them produced by chemical means is the Arbor Dianæ, formed by the addition of mercury to an acid solution of $AgNO_3$. Joulé gives its formula as $Ag_2Hg$ ; 52 per cent. silver, 48 of mercury. A native silver amalgam, $Ag_2Hg_2$, is a crystalline mass, but the metals are not in atomic ratios. Another, $Ag_2Hg_6$, native to Chile, is not a chemical compound.

When silver is in a finely divided state it combines readily and quickly with mercury, and sets very rapidly, expanding in crystallizing (Fletcher, Kirby, Hiorns).

The 48 per cent. of mercury added to 52 per cent. of silver is too low a percentage to produce a workable mass. To acquire the plasticity necessary for dental use about 75 per cent. of mercury must be used,—over 20 per cent. excess, chemically.

An amalgam of copper, according to Hiorns, has the same density hard as when soft ; there is then no shrinkage upon setting.

Dr. Black's tests are corroborative evidence of this ; and Dr. Kirk predicted fixedness in this amalgam upon purely theoretic grounds.

Viewed as a chemical compound, copper amalgam should have the formula of $CuHg$ ; by weight, 63 of copper to 200 of mercury.

According to Dr. Black's observations, no physical forces which this amalgam encounters in dental use are sufficient to destroy it. Chemically it is self-protective by the film of sulfid which forms upon its surface. It is a well-attested clinical fact that many specimens of copper amalgam are lost through some form of disintegration, which destruction has as a feature the absence of the sulfid coating to the filling.

As the conditions of the human mouth are a tolerably constant factor, most of the variations being probably matters of quantity rather than quality, it is most probable that the source of this inconstancy must be sought in some defect of the material itself.

No physical forces being sufficient, and the chemical conditions not varying enough to account for its dissolution, it is evident that some chemical fault must be inherent in the material.

A chemical compound of copper and mercury possesses certain properties. A specimen under examination does not possess them; ergo it is not the same substance. The fault may be one of ratio, or of mode of combination. Either the metals are not in atomic combination, or else the specimen is an amalgam of $CuHg$ loosely combined with an excess of mercury; or it might be there was an insufficiency of mercury, an amalgam of $CuHg$, holding metallic copper by feeble bonds.

Judging from the several directions as to the making of copper amalgam, it is inferred that an excess of mercury is a probable explanation in some or many instances.

Dr. Ames's hypothesis is that in these imperfect specimens the union of the metallic atoms is prevented by a coating of oxid enveloping the copper particles. Such an amalgam would consist of an indefinite mass of heterogeneous composition ; one in which physical forces could effect its destruction ; or there might be such electro-chemical conditions established as to hasten its disintegration.

Admitting the probability of the truth of this view of Dr. Ames, it furnishes an argument for the washing of copper amalgam while it is in the soft state, using for this purpose an agent capable of destroying the objectionable metallic salt. For instance, a strong solution of ammonia or a weak solution of sulfuric acid followed by a washing with a solution of sodium hydrate, and then squeezing out the excess of mercury. I have seen somewhere the direction given, to repeatedly squeeze the softened amalgams until particles of copper become distinguishable.

As a copper amalgam, AuHg, is white, it is evident that a specimen in which copper is visible would be faulty, probably through non-union of the metals or else a deficiency of Hg.

The next group, the ternary amalgams, are those of immediate interest ; first, the alloys of silver, tin, and mercury,—a tin and silver alloy being made and dissolved by the third metal.

While in a molten state, metals are in a condition in which atomic affinities may assert themselves. Thus, given a mass made of molten metals, they will combine according to the relative strengths of the chemical affinities, and the first compound formed be one in which the metals are united in atomic ratios.

Silver and tin, judging from their positions in the electro-chemical scale, will unite strongly, and, irrespective of the amount of metal present, will form first an alloy of $Ag_2Sn$ ; the remainder of the mass, the metals in excess, would be attached to this radical in an indefinite manner. $Ag_4Sn$ might possibly be formed, and beyond this the metals might be combined in any ratio.

By the addition of mercury to the silver-tin alloy, we have new conditions.

Regarding the manner of this union there are two possibilities. One is, that the amalgam is formed by the union of mercury with silver and tin, without the dissociation of the alloy molecule ; that is the formula $Ag_2Sn + Hg$.

The next is, that the mercury breaks down the molecule, forming an amalgam of silver and one of tin, so that its formula would be $(Ag_2Hg) + (SnHg)$.

The bonds of affinity in the latter case being weaker than in the former.

As possible support to this view, it is noted in Dr. Black's tables that, as regards contraction and expansion, some of the amalgams behave as though they were mixtures of the metals, the properties of the mass varying as to the preponderating metal ; thus, those in which tin is in excess contract, those in which silver is greatly in excess expand, and the indifferent point is reached at about 60 Ag and 40 Sn.

Opposed to this view is the marked difference of results when these separate amalgams are formed deliberately, and next, when the amalgam has been made with an alloy of the same ratio.

Chemical union is most readily effected when the metals are in the condition of precipitates.

An amalgam $(Ag_2 + Hg) + (Sn + Hg)$ is atomically

$$(216 + 220) + (118 + 200)—$$

$$416 \quad + \quad 318—$$

In a molecule of 734 there are 400 parts of mercury and 334 of the alloy metals, or 54.5 per cent. of the former and 45.5 of the latter. The tin and silver are present in the ratio of 64.7 per cent. silver, 35.3 per cent. of tin.

In Dr. Black's table, precipitated metals were used thus:

Ag 60 + Sn 40 + 55.41 of mercury, and it made the amalgam of least crushing stress and greatest flow of any.

Amalgam made from an *alloy* of the same ratios differs widely in its behavior.

This separate amalgam idea is practically the view heretofore held as to this combination: That amalgams of the several metals possessed singly certain properties; an amalgam made with an alloy of several metals would evince the characteristics of each of the metals, as shown while each is in a binary amalgam.

Thus, a silver amalgam sets quickly, expands, and discolors; one of tin sets slowly, contracts, and maintains its color; a combination would possess the properties of both, and they would act as mutual checks upon each other. The addition of gold would produce modifications, but, strangely, this metal has been accredited with properties the reverse of those it exhibits in a binary amalgam. Zinc would make the mass granular, frangible, and give it a grayish white color.

Platinum, reasoning from analogy upon the same basis, should delay the setting, and form but little union in the mass, as its affinity for mercury is slight. Copper should control shrinkage and increase the rigidity.

That there is a semblance of these predicated effects is undeniable, but it appears to the writer that Dr. Black's work shows an additional element purely chemical, to which the effects noted of each metal are additions.

That is, that in amalgams the several metals combine in atomic ratios, and where the entire mass is homogeneous,—made up of a compound of satisfied affinities,—we have a body which is fixed, crystalline, and rigid when set. That the metals of the alloy in excess of the amount stated are also combined with mercury, giving the effect of a separate amalgam, added to the primary amalgam of atomic ratios.

The probable mode of action is as follows: When mercury is added to a quantity of alloy in sufficient amount to effect its perfect solution, it would, as stated by Dr. Kirk (sup.), combine atomically with those metals for which it had the strongest affinities, and crystalline portions of a chemical amalgam separate and be surrounded by a solution of other metals in mercury. These in their turn would crystallize and form other amalgams, and, according to their constituents, would modify the physical and chemical properties of the mass.

Make a solution of one of the commercial alloys in mercury, and pack in a matrix. Pressure drives the crystalline chemical amalgam first formed to the bottom of the mold, and a solution of the chemical excess of the metals is forced to the surface, so that the surface of the mass differs in composition from its base.

Note in this connection the results of some of Dr. Black's experiments, in which the bottom of a plug is unchanged in form, and yet its surface has contracted. It is probable that the conditions described above are here present.

Again, recall his observation that contraction, as seen from the surface, is lessened when there is an even distribution of the mercury, implying necessarily that throughout the mass there is a uniform distribution of an indefinite amalgam ; hence change of form due to the contraction of the latter would be uniform.

This secondary amalgam, if forced to the surface when fluid, would exhibit its features in that part.

Again, "cutting away this secondary amalgam or softened portions lessens contraction, which probably indicates that by the removal of a solution of metals in chemical excess a more uniform mass remains."

Alloys of 60 silver to 40 tin are usually combined with fifty per cent. of mercury, and the excess of this metal expressed before packing the amalgam.

It is shown by Dr. Black that this amalgam is one of the most stable, but yet is not unchangeable ; its volume line is curved. (See tables in August COSMOS.) Accepting that a chemical combination of the metals produces the body having the greatest stability, the amalgam noted must resemble such a compound as this one of 60 to 40.

The nearest atomic combination is $Ag_2Sn$ (216+118), a molecule of alloy 334 combined with fifty per cent. of mercury, or a weight of 334 of the latter metal. As some of this mercury is expressed, the nearest ratio would be $Ag_2Sn+Hg$, or 334+200.

The alloy 216 to 118 equals in percentage 64.66 silver, 35.33 tin.

The mercury present, 200 to 334, or a percentage of 62.5 per cent. of alloy, 37.5 per cent. of mercury.

Dr. Black's lists show tests of an alloy of 65 silver 35 tin—55.4 per cent. of alloy combined with 44.60 of mercury.

This amalgam suffered no change of volume or form. There are no tests recorded of its flow or crushing stress. It will be noted that there is seven per cent. chemical excess of mercury. An amalgam of 60 Ag, 40 Sn+38.58 Hg gives a flow of but 2.91.

One of the most interesting of his observations is that when the percentage of silver is above or below from 60 per cent. to 65 per cent., an increased amount of mercury is required to procure plasticity. The alloys therefore deport after the following manner :

$Ag_2Sn$ being almost 65 silver to 35 tin, less silver would represent a relative increase of tin, that is, attached to the $Ag_2Sn$ radical we have $Ag_2Sn+Sn$. With an increase of silver, $Ag_2Sn+Ag$. A molecule of the radical requiring an atom of mercury, there remains an atom of either silver or tin which requires an additional amount of mercury to effect its solution.

The 65Ag, 35Sn+Hg is the only amalgam except that of copper which remained unchanged ; that is, the specimen most closely approximating a chemical alloy was the most stable.

The next possible chemical compound of the metals would be $Ag_4 Sn+Hg_2$ or 432+118+400 ; 57.9 per cent. of an alloy of 78.55 per cent. of silver+21.45 per cent. tin combined with 42.1 per cent. mercury.

Dr. Black's nearest amalgam is 80 silver, 20 tin+56.56 of mercury, a compound which was not stable ; it expanded greatly. With 50 per cent. of mercury it made a dark semi-coherent powder very difficult to pack ; with 60 per cent. a plastic mass resulted, and there was a diminished flow and an increase in the crushing stress. As this compound is not fixed as to its form, it is assumed that the union has not been of $Ag_4 Sn+Hg_2$; but as the amalgam expands, it has the features of a silver amalgam in combination with a fixed base of a silver-tin amalgam.

Its action is as though the formula were $(Ag_2SnHg)+Ag_2Hg$.

The affinities would be mutually satisfied, but the combination would be of two amalgams. With the 70 Ag 30 Sn alloy + 46.36 of Hg there is a primary expansion, not very marked, and a secondary contraction.

Below the fixed line of 65 to 35 the crushing stress decreases, and the flow increases, but not markedly, and the form line descends. The contraction series begins.

Dr. Black points out the constancy of the form of this contraction curve, although its extent varies.

Amalgams of $Ag_2Sn_{1-}+Hg_{1+}$ expand in setting. Those of $Ag_{2-}Sn_{1+}+Hg_{1+}$ contract. The amalgam $Ag_2Sn+Hg$ appears to be fixed, neither contracting nor expanding, and although the flow of such an amalgam was not recorded, the one of minimum flow approximated in composition, this, the chemical amalgam.

It will be noticed that throughout the series there is a chemical excess of mercury, or mercury which is apparently not in intimate chemical combination.

The entire series shows that we may accept, at least hypothetically, that in the ternary amalgam under discussion there is a central radical of $Ag_2Sn$, and that by the addition of other metals the properties of the amalgams are modified. When mercury is united with a ternary alloy, a quaternary amalgam results which apparently deports as though the structure were $(Ag_2Sn+Hg)+\text{metal}+Hg$.

The first of the ternary alloys and quaternary amalgams noted by Dr. Black is the 65 silver, 30 tin, and 5 of copper. A compound of these three metals united in atomic ratio would be probably $Ag_2SnCu$, the tin quadrivalent, $Ag_2$ (216) + Sn (118) + Cu (63), or 54.4 per cent. of silver, 29.72 per cent. of tin, 15.88 per cent. of copper.

With the exception of the alloy containing five per cent. of copper, all of the quaternary amalgams give irregular volume curves, showing corresponding molecular changes occurring in the mass.

No tests are given in Dr. Black's tables—nor anywhere else that the writer has ever seen—where ternary alloys (quaternary amalgams) have been made in atomic ratios.

The tables show unquestionably that copper is the only metal added to the silver-tin amalgam which has a tendency to increase its rigidity and lessen, but not controlling entirely, the change of volume of the amalgam during crystallization of the mass.

By the addition of other metals to the silver-tin alloy the problem becomes complicated. We have no evidence, direct or indirect, that mercury would unite with the molecule $Ag_2SnCu$ without dissociation of the latter, and no tests appear to have been made with such an alloy, nor, indeed, has this alloy itself been made.

Reverting to the idea of a silver-tin radical, in Dr. Black's tables, that any metal other than copper added to the radical at once enormously increases the flow. Copper is the one addition which lessens it. Gold increases it in about the same degree as platinum, —nearly ten fold,—and so with zinc and with all other metals present in the alloys tested ; none of these metals, according to the several lists of analysis, having ever been combined in atomic ratios in a ternary alloy.

Additions of gold, platinum, or of zinc increase the shrinkage of the amalgam mass, and amalgams of which either is a component have an irregular contraction curve ; showing that for an indefinite time the presence of a third or fourth metal in a silver-tin alloy causes prolonged molecular disturbances which are absent in the basal amalgam.

Practically, judging from the evidence presented in the tables, with the exception of copper, any metal added to a silver-tin alloy exerts a deleterious influence as to its physical properties, the possible virtue being an improvement of color.

In a silver-tin-gold alloy, should the mercury exert its specific affinities, a gold amalgam would be first formed, and as it appears, from the general action of the assumed radical of silver and tin, the latter has not its metals dissociated ; so that theoretically the amalgam mass would be $(Ag_2Sn+Hg)+(Au_2Hg)+x$.

A basal amalgam to which is attached an amalgam of gold, which has, as one characteristic, softness.

With platinum, the affinity of mercury for which metal is slight, it would possibly form, with the excess of mercury, a separate amalgam. With zinc, a similar deportment ; so that with these quaternary amalgams we should have a basal amalgam of silver, tin, and mercury, which might, according to the ratio of the metals present, be in itself a double amalgam ; and added to these an amalgam having of itself certain properties which will modify those of the body general.

An examination of the contraction tables shows that, as Dr. Black has said, a governing factor in the deportment of the mass is the uniformity of the distribution of the secondary amalgam.

The practice has been advocated of applying to freshly inserted amalgam fillings metals which have a strong affinity for mercury, with a view to remove the excess of this latter metal which is forced to the surface during the operation of packing. The first method applied for this object is placing sponge gold on the filling and removing the binary amalgam as soon as the gold is saturated. This is the method advocated by Dr. Kirk.

A second method is using gold and permitting it to remain ; the method followed by Dr. Ottolengui and others. There is added thereby to the filling a soft-surface amalgam. The method of using hardened amalgam for the same purpose, and pressing it to union with the filling by means of heated burnishers, adds to the surface of the plug an amalgam containing an excess of mercury.

Thus, a crystallized amalgam composed of, say, $Ag_2SnHg$ is added to the soft surface of freshly introduced amalgam; uniting with this, the surface of the plug becomes approximately $Hg+Ag_2SnHg$.

There is another matter touching the chemical combination of mercury with dental alloys which has been investigated by Dr. Black. He finds that alloys cut fine require more mercury to effect amalgamation than do those of coarse cutting. The latter amalgamated make the stronger masses, and mortar mixing decreases the strength of the product.

The explanation of these several features is very probably found in chemical laws.

With fine filings a greater number of alloy molecules are brought into contact with the solvent mercury. With an increased size of the alloy particles a less surface is offered for contact with mercury, so that unless sufficient mercury has been used to effect perfect solution of all the alloy particles, the mass represents one in which the surface of each particle is composed of amalgam, and the plug itself a mass of alloy pieces, the former acting as a cement binding together the latter.

With a coarse-cut alloy the plug is relatively stronger because of the greater amount of the silver-tin alloy present as a framework or stroma. A silver-tin alloy being stronger than a silver-tin-mercury alloy, the strength of the mass must be largely influenced by which of the two alloys predominates.

Hand mixing produces superficial amalgamation. Mortar mixing breaks down the alloy particles, or rather breaks down the masses of silver-tin amalgam, and thus offers an increased surface for combination with mercury. Any form of physical violence in mixing or packing would exert a similar influence. This is stated by Dr. Black to be true.

One of the most interesting features of Dr. Black's investigations is the finding of a property unique to amalgams, viz, that of "flow." It is the property of yielding constantly to a steady stress, and yielding repeatedly to the same amount of stress even when applied at intervals; it is the antithesis of rigidity and elasticity. It is such a change of form as the extension of a thick mass into a thin lamina without the development of the elasticity and rigidity common to all other metals, or combinations of them.

It is at zero with copper amalgam, the next, silver, 55, tin 40, copper 5 + 32.66 mercury when it is about 2 per cent. The next with 80 to 20 AgSn + 60 per cent. Hg; next 60 to 40 AgSn + 38.58 Hg. In none of the AgSn alloys does it rise above 9 per cent.

The addition of even ¼ of 1 per cent. of zinc causes a rise to over 25 per cent. Four per cent. of gold and three per cent. of platinum exert an equal influence. Even the additions of 1.87 per cent. of gold and .62 per cent. of platinum increase the flow to 20 per cent.

Examining the several metals, Dr. Black finds that tin possesses the property in some degree, silver not at all, and in an alloy of silver and tin it is absent.

The proposition thus stands:

Tin flows; silver does not; silver and tin does not; silver, tin, and mercury does flow. The addition of mercury has therefore determined the flow, and from the evidence presented it is looked upon as the determining factor of this phenomenon.

Copper amalgam, a presumably chemical combination of the metals, does not flow. In the silver-tin amalgam, 60 to 40, with 38.58 per cent. of mercury, or its practical equivalent, 55 silver, 40 tin, and 5 copper, have the least flow of any. Comparing the ratios of alloy and mercury, it is seen that the least flow is associated with those amalgams most nearly containing mercury in atomic ratios.

In only one of them is this ratio present, that is in copper amalgam. In other combinations of mercury and alloys, a marked chemical excess of mercury must be present to form a workable mass.

It is inferred, therefore, that as bodies containing this excess do crystallize, the surplus mercury must occupy a position analogous to that of the water of crystallization.

As it has been shown by Joulé that much mercury may be expressed from a hardened amalgam, even when the metals are present in atomic ratios, it becomes evident that physical forces can detach from metals in amalgam all mercury save that in most intimate contact. For instance, speaking figuratively, 18 atoms of gold hold in chemical combination 9 atoms of mercury; by physical means, 7 of these mercury atoms may be torn away from the gold, leaving 18 atoms of the latter metal holding 2 atoms of mercury, grasping it so firmly that ordinary physical forces do not effect dissociation.

This is the change noted in an amalgam reduced from $Au_2Hg$ to $Au_9Hg$.

In view of the existence of the property called flow, we must recognize some peculiar molecular arrangement of the mass. Probably there is a stroma of an amalgam made of metals in atomic ratios, in the meshes of which are other amalgams, held in combination with the general mass by such light affinities that even physical forces, such as pressure, serve to disrupt them.

Considering the foregoing facts, the writer at present infers that the property of flow is traceable to an excess of mercury present in most of the amalgams tested, except that of copper, as we have seen.

As it is impracticable or impossible to make a workable mass when the mercury is added in atomic ratio, in those which do contain an amount sufficient to permit manipulation there are left, inevitably, more or less of loose compounds in amalgams; these, by their weak affinities, permit an indefinite molecular re-arrangement and thus modify the stability of the mass.

The writer finds in the literature of dentistry but one possible solution of this difficulty; it is that suggested by Dr. Kirk in the essay noted early in this paper, "By adding an excess of mercury and procuring perfect solution of the alloy metals; then, when the several atomic affinities have been satisfied, wring out the mass and compress in chamois, so as to expel the surplus mercury, together with such excess of the alloy metals as may be unnecessary in the forming of atomic compounds."

Even this method could not express all of the surplus and leave a workable mass, but in connection with sponge gold as an absorbent it is nearer a practical solution of the problem than we have yet found.

Dr. Black has shown the best responses to tests are furnished by amalgams which, when packed, represent an equal distribution of the constituents.

It is stated (p. 655) that when an amalgam mass has partially hardened, it is then packed ; the contraction has been less than when the mass has been used in a more plastic state, evidently the contraction due to the re-arrangement of the molecules of the metals, according to chemical laws, has occurred, and, when packed partially hard, a cavity is being filled with a chemical compound, instead of an indefinite solution of metals ; in the latter case, changes occur, which have already taken place in the former.

Dr. Kirk, in his essay, called attention, on theoretical grounds, to the desirability or necessity for the making of a homogeneous mass, in order to secure the end sought.

Examining the flow tables, and the degrees of the flow with the several alloys, we find another matter, in which we are driven to a radical change in our views and data ; it is with the quality or peculiar resistance which has been known as edge-strength.

It has been used to describe the degree to which amalgam masses resisted fracture of their angles.

The discovery of the property of flow clouds all of our former ideas of this quality, for the edge-strength teachings were associated with the conception of amalgam being an essentially brittle compound of variable rigidity.

In the light of Dr. Black's work, great edge-strength would be associated with the greatest crushing stress and the least flow. By the same reasoning, edge-strength is comparative rigidity.

To gold has been attributed erroneously the property of increasing the edge-strength. Examining the tables, we find that, while adding nothing to the resistance to crushing stress, it increases tenfold the flow. This error no doubt arose from the flow of such an amalgam obscuring its lack of rigidity. That it did not break appeared to demonstrate, by the resistance to fracture, that it was more resistant than an amalgam which did not contain gold. That was with the premise of absolute brittleness ; but from the flow we see that, although it does not break, it may change form and thus disguise its lack of rigidity. So that, instead of giving high edge-strength, gold added to alloys lessens it, as do all metals save copper.

Another matter in which our views must undergo radical change is regarding spheroiding of amalgam.

Our conceptions of this process, before Dr. Black upset them, were substantially as follows. I append a short account of this matter written before the appearance of Dr. Black's papers, and promptly set aside when they were published :

### *Spheroiding of Amalgams.*

Numerous observers have stated that some amalgam masses, after a length of time, project beyond the borders of cavities with which they formed a flush surface when freshly introduced. A surface which was originally flat assumed a curvilinear outline.

Loosening and extrusion of a plug through the presence of adventitious substance beneath it is common, but this may occur without any perceptible alteration of the original form of the plug.

The bulging effect noted is technically known as spheroiding.

The writer has never had positive proof of the existence of the condition noted, but, as there does not appear to have been any hypothesis advanced explanatory of such an effect, the following is submitted :

All metals in the molten state, even when resting on a plane surface, tend to assume the spherical form.

A centripetal attraction exists which tends to overcome the force of gravity in some degree ; that is, the force as exerted upon the individual particles of the molten mass.

The tendency becomes more marked with increase of heat, so that before the point of vaporization a greater mass of metal will assume the spherical or spheroidal form than when just above the melting point. Upon solidification, gravity asserts itself, and the mass flattens to some extent. Fluid mercury has this spheroidal tendency marked.

Joulé has shown that from hardened amalgams free mercury may be expressed if great pressure is applied.

There is no doubt present in most amalgam masses, when set, more mercury than required for perfect chemical combination ; so that, in all probability, an amalgam plug consists of a mass of crystals of the alloy combined with mercury. Distributed in the interstices of the crystalline mass will be an unknown quantity of loosely combined mercury. So that virtually such a plug consists of a meshwork of crystals of chemically combined mercury with the metals of the alloy, with mercury contained in the meshes in an unknown manner.

While this combination persists, the mercury must have the tendency of all molten metals of assuming the spherical form, and, if present in sufficient amount, the force exerted may be great enough to produce change of form of the material, the body of the filling.

We may deduce from this that the spheroidal tendency should increase in the ratio of the mercury present. Also, the tendency should decrease with combinations of metals which are known to form hard amalgams, those having great edge-strength, and increase with those which form amalgams lacking edge-strength ; both these propositions appear to be substantiated by the recorded experiments of dental metallurgists ; for instance, amalgams of tin and mercury are soft, and it is said that in them the spheroiding is most pronounced ; with the addition of gold, the edge-strength increases and the spheroidal tendency lessens.

Another clinical evidence is that the removal of mercury from fillings by expression during the packing process is said to diminish the tendency.

This explanation is necessarily hypothetical, so far as the personal observations of the writer are concerned ; a change of form indicating spheroiding has not been noted in any case seen by him.

Dr. Black's work shows but two classes of form change, one contraction with silver-tin alloys, containing less than sixty per cent. of silver, and all quaternary amalgams, except those having copper in a ratio of 55 silver to 5 copper.

In the ternary amalgams of silver and tin, when the ratio is above 65 to 35, expansion occurs ; the mass being held at its sides and bottom bulges at the place of least resistance, bulges as a mass of ice from a cylinder open at one end.

The contraction resembles that of a cylinder of soap in drying.

So that the question of spheroiding may be set aside entirely, for, in addition to the facts noted, there is no rounding of angles.

In concluding this question of amalgam flow, I desire to call attention to just one point, and that is the possibility of amalgam, through its flow, exerting pressure upon an elastic lamina of dentine covering a pulp.

There are instances where, in very deep cavities in teeth having but a thin layer of dentine covering the pulp, large amalgam fillings are sometimes placed without the interposition of a non-conducting and rigid layer of cement; the amalgam being subjected to the direct or almost direct force of mastication. There are many such cases, and so long as responses to thermal shock are not particularly noted, the tooth is regarded as saved.

It is suggested that the flow of the amalgam may exert an increasing pressure, and cause pathological processes which would not occur were this element of pressure eliminated; the discussion of this, however, would require an essay in itself, there being so many factors involved.

One feature of this general subject is to be emphasized, and we may conclude, not for lack of material, but for want of space.

There appears to the writer to be one constant basis in the ternary amalgam series, the atomic compound of $Ag_2Sn + Hg$. Further additions of either of the metals appear to have the effect of a secondary amalgam being added; thus, if silver, it confers upon the basal amalgam the properties of an $Ag_2Hg$, in addition. If of tin, it is modified as though an $SnHg$ alloy were added.

With other metals the union does not appear to be as intimate, but according to which metal it is, it imparts the properties of an amalgam of that metal, distributed throughout the mass of a primary amalgam of $Ag_2Sn$.

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# SUSPENSION DENTURE.

BY C. L. ALEXANDER, D.D.S., CHARLOTTE, N. C.

MANY methods have been advanced and practiced for constructing an artificial denture where one or more of the anterior teeth have been lost. We all know that the old-fashioned plate is objectionable and cannot be tolerated by numbers of our patients. We also know that it is a serious matter to cut the crowns off of good teeth, or to disfigure and deface them in order to construct a bridge. I think the suspension denture, made and adjusted as will be described below, will in a measure supply a long-felt need in this special branch of prosthetic dentistry.

A suspension denture consists of an anterior part made of porcelain facings, and a posterior part made of gold or other suitable material. When these parts are placed in the mouth and secured together, the denture is retained in position by close adaptation to adjoining teeth, and further supported by metal posts set in the lingual surface of the adjacent teeth.

After preparing the holes for the gold post in the lingual surface of the teeth, the first step to be taken in constructing a suspension denture is the selection and adjustment of a porcelain facing or facings, as the case may require.

If only one tooth is to be replaced, we will find it preferable to grind and adjust the facing to the natural teeth in the mouth. By doing this, we are assured of a more perfect adaptation. The facing should be broader than the space to be supplied, thus allowing it to slightly overlap the adjoining teeth. The facing is then backed up with gold (28 gauge) in the usual way, placed in position in the mouth, and an impression taken from the lingual aspect. Before doing this, however, we should place what we term a guide post in the holes made for the reception of the metal post. The guide post will come out with the impression, and aid in the construction of the metal work. Before making the model, consisting of marble-dust and plaster, the gold backing is placed in position on the impression, and a staple of fine binding-wire is introduced through the holes made for the platinum pins (Fig. 1).

FIG. 1.

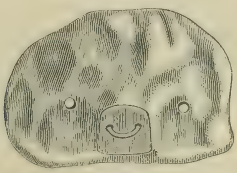
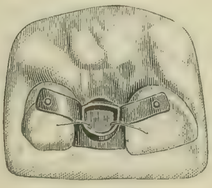


FIG. 2.



The model secured in this way is provided with gold arms, extending from the backing to the guide post and engaging them, also with a gold band encircling the holes through which the wire staple has been introduced (Fig. 2).

After bending the ends of the wire down upon the band to hold it in position, the little inclosure is filled with the investing material, which prevents the solder from flowing in. By soldering in the usual way the parts are all united, and, when finished up, the piece is adjusted to its place in the mouth, the gold posts having already been secured in the holes made for their reception. A little cement mixed quite thin should always be smeared within the holes and upon the screws, before inserting them. When the facing has been placed in position, the pins are bent down within the little chamber, to secure the denture to its place (Fig. 3). The piece is finished by filling the chamber with some suitable material. I prefer to fill over the pin with cement, then finish up with amalgam, made as dry as possible.

FIG. 3.

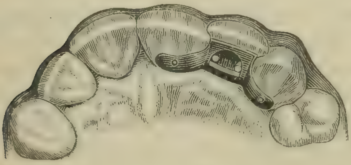
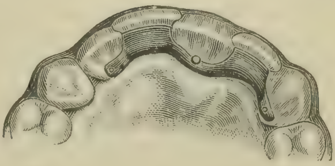


FIG. 4.



The advantage of this method is the ease with which the denture can be repaired in case of an accident. I have adopted this method for securing all anterior facings, both in crown- and bridge-work, for a number of years. I cannot emphasize the value of this point too strongly. A trial of it will convince any one of its advantages.

Fig. 4 represents a practical case as constructed by the writer at a clinic before the Mississippi Dental Association last April, showing the advantage of the suspension denture.

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## FRACTURE OF THE INFERIOR MAXILLA, WITH TREATMENT.

BY W. W. COON, D.D.S., ALFRED, N. Y.

(Read before the Eighth District Dental Society, Buffalo, N. Y., September 30, 1895.)

A VERY recent case of fracture of the body of the inferior maxilla which presented itself to me I treated in the simplest manner I could conceive, and am so thoroughly surprised that in looking up the literature of this matter I find nothing which approaches the method used for simplicity, that I venture to make it the subject of a short paper to present to you.

I see no advantage in wearying you with a text-book compilation of the anatomy of the bone, a description of the multiplicity of ways in which it is exposed to injury, or a delineation of the innumerable methods adopted for treatment of its fractures. Three propositions amply justify my attempt to renew your interest in the matter and elicit a little discussion.

First. Of all the bones of the body, it is the most exposed to injury.

Second. When fractured, it is the most difficult to retain in correct position ; and

Third. Most cases are subjected to unnecessary pain and inconvenience in treating by the use of interdental splints. I say most cases, because the method of which I am about to speak can be used only when a tooth or teeth are contained in each of the fragments or portions of jaw fractured, and this condition is most commonly presented.

The procedure consists of fitting a metal band accurately to one or more teeth contained in the distal fragment, and soldering to its buccal side a stiff metal bar that shall, when the fracture is reduced, pass in apposition with the buccal side of a loosely-fitting band or bands surrounding a tooth or teeth contained in the other fragment or fragments. Then with the bands on the teeth (uncemented as yet) mark with an excavator point a line on each band the bar passes,—a horizontal mark on a line with the bar and a perpendicular mark on both band and bar,—to indicate where they shall be soldered ; then remove and solder, all of which a dentist will accomplish with little or no trouble.

Competent assistance may be necessary in maintaining an accurate adjustment of the fragments while the bands and bar are being marked. This done, and the marked places soldered, what remains to perfect the "band-and-bar splint" is to crimp in the ends of the loosely-fitting bands, so as to firmly retain the cement used in its final adjustment, and placing it on the teeth again (the fractured fragments in right apposition), to determine the accuracy of your soldering. If any deviation has been made, it can be easily corrected, either in the bar or bands, as only the band to which the bar was first soldered is an accurately fitting one, and the appliance is ready for cementing in place. The bands are made loose enough to allow of considerable crimping in at the bottom, *and to allow the appliance to be adjusted on the teeth before the fragments are in perfect apposition*, as it is difficult to maintain such apposition with the mouth sufficiently open to allow it to be placed in position; but while it is going on to the teeth with the cement for its final adjustment, the parts are brought into proper relation and rigidly held so for the little time it takes the cement to harden.

When this is accomplished, the fragments are held as in a vise. There is not the least mobility possible, and no undue strain is given the teeth, as is the case when they are ligated with wire or other material, or when "Angle's method of fixation" is used. The advantages are many, and very apparent to both operator and patient. The ease and quickness of construction are considerations of value to the operator. The absence of interdental splints and bandages, the use of the jaw in easy speech and mastication, and nothing in the mouth to prevent cleanliness, will be appreciated by all who are in the habit of appreciating anything.

The case from which the band-and-bar splint that I show you was made severely tested its utility with loose teeth that would not have withstood strain.

The patient, a middle-aged farmer, while backing a heavy seeder out of a barn, was struck under the jaw by the tongue of the implement with such force as to give him not only a single compound fracture of the right half of the body of the jaw, but to knock out what few upper teeth he had that came into occlusion. The left fragment of the lower jaw contained but one tooth, a second bicuspid, which was quite loose, the fracture being slightly oblique from the space of the first bicuspid toward the symphysis. He was suffering intense pain when brought to my office by the physician to whom he went.

The fractured portions fell away from each other, the left portion especially being lower than one would expect it to be. You will correct me by saying that the *muscles drew them away* from one another, but I say they "fell away"; because they hung perfectly loose, and the muscles you speak of are at rest except when in voluntary action, and such action only obtained when I hurt him severely in moving the fragments. This "band-and-bar splint" was made in a very few minutes, gold being used only because I did not have German silver, and, when placed in position, most of his pain stopped.

He was directed to use his jaw as little as possible on account of the extreme looseness of the second bicuspid; and for more temporary comfort, to rest his jaw and not hurt the upper gums, borated cotton was placed over his lower teeth and a four-tailed bandage applied, which, however, was not tight enough to be much support to the jaw, and was dispensed with very soon. I did not see him again until a month had passed, when he came to have the splint removed. It was perfectly solid on the teeth, and the second bicuspid was much firmer than when the splint was applied. He reported having had a very easy time: said the bone had been united solidly for a week past. It was certainly so now, and the bands were cut off.

The result was all it could be, and was attained with very little effort or time spent on my part, and little inconvenience on his part.

Had there been more teeth in the shorter fragments, or had that tooth been firm in its socket, I know no reason why he could not have masticated well from the first.

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## DEATH FROM THE ADMINISTRATION OF CHLOROFORM.

BY D. F. BENTLEY, D.D.S., NIAGARA FALLS, N. Y.

(Read before the Eighth District Dental Society, Buffalo, N. Y., September 30, 1895.)

A SHORT time ago I had the misfortune to be present when death resulted from the effect of chloroform—viz, On August 31, Mrs. C., a lady fifty-eight years of age, of rather fair health, made arrangements with me to have fourteen teeth extracted, with the understanding that her family physician would be present to administer chloroform.

The next morning, about 9.45, her physician called for me, and we at once went to her residence, which was only across the street. On arriving, we found her feeling a little nervous, and she remarked that she dreaded it very much and wished it was over with.

The physician examined her very carefully as to the condition of her heart and lungs, and stated to her that he would rather she would take ether than chloroform, but she insisted on taking the latter.

He placed her in an ordinary rocking-chair, tipped well back and retained in position by placing a block of wood underneath the rocker. He proceeded to administer the chloroform, using the Esmarch inhaler. I felt her pulse then, and found it to be about 100.

After she had been taking the anesthetic for about five minutes, she had an attack of spasmodic struggling, but it only lasted for a moment, and after that she took very long and fast inhalations; at this time her pulse, I should judge, was about 80, and very distinct and regular. In a short time the physician remarked that he thought she was fully under the influence, and told me to go ahead with the extracting. I at once proceeded and successfully performed the operation, taking, I should judge, less than one minute's time. Immediately after the teeth were out we tipped her to one side to let the blood run out of her mouth, as the gums bled very freely.

At this time she appeared to be doing very nicely, but just as I stepped away to get a towel (which was within a few feet of the chair), the physician remarked, "Let us place her on the bed" (which was near the chair); in doing this, I noticed her face was quite purple and her pupils very much dilated. I at once began the artificial respiration method, while the doctor injected hypodermically spirits of ammonia. After working over her for less than a minute, she appeared to gasp for breath. I then felt her pulse and placed my ear to her heart, but discovered no indications of life.

I then proposed to the doctor that I go and get another physician. He agreed with me, and within five minutes' time I returned with one. He examined her and said nothing, but, pulling off his coat and grasping the body, pulled her partly off from the bed, so that her head hung over the side; placing a heavy coat underneath her shoulders, he began Sylvester's method of artificial respiration; at the same time I was holding the tongue out with a pair of forceps, and the other doctor was injecting, hypodermically, several different cardiac stimulants. We all took turns at the artificial respiration method, for it was very hard work.

Several times we inverted the body, with her head hanging down and her heels high in the air, in which position we would hold her for about two minutes at a time. They also injected by the rectum about one pint of strong, warm coffee. While all this was taking place, the ladies present were applying hot-water bags to her lower extremities.

We continued working until about 11.30, when the physicians gave up all hopes of recovery. I would state, however, that the time the doctor started to administer the chloroform was 9.55, and it was 10.20 when we laid her on the bed. The amount of chloroform used was about two and one-half drachms.

*Report of Physician.*—On September 1, 1895, I was called to the residence of Mrs. C., a lady fifty-eight years of age, to administer chloroform for the extraction of teeth. Her heart was in good condition: no murmur, no intermission or irregularity of sound.

So far as I could see, there was no objection to giving chloroform, if the patient objected to ether.

The patient was placed in a rocking-chair tipped back as far as it would go, and chloroform given in an Esmarch inhaler. In from fifteen to twenty minutes she was unconscious, the teeth were extracted quickly, the patient tipped to one side for a short time to allow blood to run out of the mouth, then laid back in the chair.

In about three minutes after the teeth were extracted, I noticed that respiration was weaker and more shallow. We lifted her to the bed and lowered her head. The pupils of the eyes were dilated.

After being placed on the bed, respiration stopped completely. Immediately, by pressing over the heart and making attempt to produce artificial respiration, dashing cold water on the face, and giving hypodermical injections of spirits of ammonia, we tried to restore life. Another physician was then called, and for an hour or more efforts were made to restore life by Sylvester's method of artificial respiration, together with hypodermic injections of atropia, ether, and brandy, rectal injections of hot coffee, etc., and inversion of the patient.

# PROCEEDINGS OF SOCIETIES.

## ACADEMY OF STOMATOLOGY.

SPECIAL meeting held October 15, 1895.

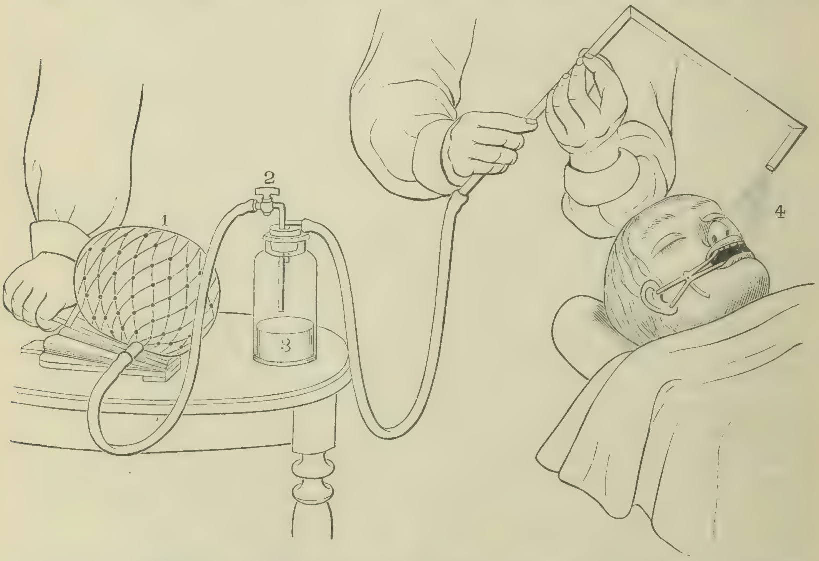
The following paper, by Dr. THOMAS FILLEBROWN, of Boston, Mass., was read by the secretary:

### A NEW APPARATUS FOR CONTINUING ANESTHESIA WHILE OPERATING ON OR IN THE MOUTH.

At the Columbian Dental Congress, in 1893, I exhibited an apparatus for maintaining anesthesia without a face-piece, which I described as consisting of "a bellows, connected by rubber tubing with the long tube of a twelve-ounce wash-bottle, with a stop-cock intervening to regulate the flow of air. From the bottle extends a half-inch rubber tube to the patient. The bottle is filled one-third full of ether. The bellows is inflated and the stop-cock opened, so as to allow the air to bubble up freely through the ether and become saturated with ether vapor. The etherized air is discharged through the second tube, a few inches from the patient's face."

I have since found it unnecessary to pass the air through the anesthetic, but obtain equally good results by simply passing the air over the ether or chloroform. I have also found that if the administration of the anesthetic is somewhat prolonged, the evaporation reduces the temperature so low as to prevent saturation of the air ; when this obtains, the hand of an assistant or a cloth wet with warm water should be applied to the bottle to raise the temperature to at least 60° F.

In cases of children I have found no difficulty in from the first maintaining a perfect anesthesia, but my experience with adults proves that they must be first thoroughly anesthetized by ordinary methods, as many adult patients require an almost entire exclusion of air for a time, to become fully anesthetized. I encountered two partial failures before I realized the cause. But with these patients, this method proved more than sufficient after the anesthesia was made complete by the ordinary administration. I have lately added a bent metallic delivery-tube, which enables the assistant to stand behind the patient while administering the anesthetic, and thus be entirely out of the way of the operator. The mouth-gag I believe to be essential to success, and I never omit its use. Perhaps infants might not need it.



1, Bellows; 2, Stop-cock to control air-current; 3, Ether over which air passes; 4, Anesthetic atmosphere discharged from tube.

I have thus far been intent on establishing the complete success of the anesthesia, and have made no effort to economize the ether. As

I now use it, four ounces of ether will maintain complete anesthesia for one hour ; further experience may make less sufficient.

With this apparatus, simple as it is, complete anesthesia may be maintained for any length of time, and any operation on the face or within the mouth of the patient be performed, and the operator will not be interfered with any more than during an operation on any other part of the body. An assistant can use the sponge freely and keep the throat clear of blood and mucus, so that only very seldom will it be necessary to use any other means to free the mouth of accumulations. The cut shows all the parts, and will make the preceding explanation clear.

The bellows is one of the ordinary dentist's foot-bellows. The bottle, with rubber stopper, is one taken from an oxygen apparatus found at the dental depots. The stop-cock is not absolutely essential, and some glass tubing will answer to pass the air through the wash-bottle. A tin-worker can furnish the delivery-tube at short notice, and rubber tubing is always at hand, so no one need be deprived of the benefits of this method for lack of an apparatus.

The following twenty-three cases show, I think, sufficient experience with the apparatus to establish the fact of its efficiency and usefulness. Eighteen of these were cases in my own private and hospital practice.

*Case 1.*—May, 1893. A student in the Harvard Dental School, who kindly consented to be an experimental subject. He was anesthetized to complete insensibility in ten minutes, without a mouth-gag. He was both willing and able to keep his mouth open.

The mouth-gag was used in all the following cases, after the patient was etherized by the ordinary method.

*Case 2.*—Male, age twenty-five years. Removal of non-erupted third molar. Complete anesthesia maintained twenty minutes.

*Case 3*—Male, age twenty-six years. Operation on lip. Anesthesia maintained twenty-five minutes.

*Case 4.*—Male, age twenty-two years. Removal of necrosis of inferior maxilla. Anesthesia maintained twenty minutes.

*Case 5.*—Female, age six years. Operation, uranoplasty. Anesthesia maintained one hour and three-quarters.

*Case 6.*—Male, age eleven years. Operation, uranoplasty. Anesthesia maintained forty-five minutes.

*Case 7.*—Male, age ten years. Operation, uranoplasty. Anesthesia maintained one and one-half hours.

*Case 8.*—Male, age eleven years. Operation, staphylorraphy. Anesthesia maintained one and three-quarter hours.

*Case 9.*—Male, age twenty-nine years. Operation, reshaping flat nostril. Anesthesia maintained thirty minutes.

*Case 10.*—Male, age twenty-four years. Operation, staphylorraphy. Anesthesia maintained one hour.

*Case 11.*—Female, age seven years. Operation, staphylorraphy. Anesthesia maintained one hour and twenty minutes.

*Case 12.*—Female, age six years. Operation, closure of hard and soft palate. Anesthesia maintained one hour and ten minutes.

*Case 13.*—Female, age sixty years. Operation, removal of encysted cuspid. Anesthesia maintained eighteen minutes.

*Case 14.*—Female, age six years. Operation, uranoplasty. Anesthesia maintained thirty-two minutes.

*Case 15.*—Female, age six and one-half years. Operation, staphylorraphy. Anesthesia maintained fifty-five minutes.

*Case 16.*—Female, age forty years. Operation, exsection of right inferior maxillary nerve. Clinic before the New England Dental Society, at the Boston Dental College Hospital. Anesthesia maintained twenty-two minutes.

*Case 17.*—Male, age forty years. Operation, staphylorraphy, at the Maine General Hospital, by Professor Weeks. Anesthesia maintained one and one-quarter hours.

This patient was not fully anesthetized when the operation was begun, and at first the apparatus was insufficient to maintain the insensibility ; but after the patient was fully etherized it was more than equal to the work, and several times the tube had to be removed on account of too deep narcosis.

In one other case I attempted its use when the patient was only partially narcotized, and I had the same trouble ; consequently I am led to doubt if it is practical to use the apparatus until the narcosis is complete.

*Case 18.*—Male, age ten years. Operation, removal of tonsils by means of the cold wire snare. A clinic before the New England Dental Society, at the Oral Hospital of the Boston Dental College, by Professor George F. Eames. Anesthesia maintained fifteen minutes.

*Case 19.*—At same clinic, a male, age ten years. Operation, removal of adenoid growths, by Professor Eames. Anesthesia maintained ten minutes.

The following cases, Nos. 20, 21, 22, 23, were operated on at the Lynn Hospital, Dr. C. M. Smith directing the maintaining of the anesthesia.

*Case 20.*—Male, age forty-five years. Sarcoma of antrum. Operated on by Drs. Stevens and Smith. Anesthesia maintained fifty minutes. "Anesthesia complete during the whole time."

*Case 21.*—Necrosis of the ramus, including the angle of the under jaw. Operation by Drs. Pinkham and Smith. Anesthesia maintained one hour.

*Case 22.*—Female, age eleven years. Removal of adenoids. Operation by Dr. Stevens. Anesthesia maintained fifteen minutes.

*Case 23.*—Male, age forty-five years. Sarcoma of antrum. Secondary operation by Dr. Stevens on Case 20. Anesthesia maintained twenty minutes.

Many conceive the idea that it is a spray which is furnished the patient to breathe, but nothing is farther from the truth. If a patient inhales from a sponge or towel saturated with ether, he does not breathe ether as such, but ether vapor. It is just the same if air is forced through or over liquid ether. The air simply takes up the ether vapor, and the patients breathe etherized air, the same as is breathed through sponge or other inhaler.

The essential merit of my invention is that the etherized air is discharged toward the patient from a point far enough from the face so the apparatus will not interfere with the operation going on in the mouth, and in sufficient quantity and with sufficient force to furnish an anesthetic atmosphere for the patient to breathe without taking in air from outside the current. I will add here that the surplus anesthetic discharged into the atmosphere will not sensibly affect either the operator or assistant.

Air containing ether or chloroform vapor has long been used for inducing anesthesia, but always with an inhaler that covered the face and rendered any operation about the mouth impossible while the anesthetic was being inhaled. Dr. Snow, in 1849, mixed chloroform vapor with air in the definite proportion of three and one-half per cent., and found it very safe, successful, and economical. Clover, in 1862, used the same mixture as Snow, and devised an apparatus for administering it, the principal feature of which was a large reservoir bag hung over the operator's shoulder. Snow, about the same time, devised an inhaler lined with lint. The lint was wet with chloroform, and through this the air was drawn by inhalation, which, while passing over the surface of the lint, took up a portion of the vapor.

Dr. Horace Packard, of Boston, a few years since devised a very convenient and compact apparatus for administering etherized air, which was suggested to him by the Junker system for giving chloroform, and it was the use of this that suggested to me the apparatus which I have described. My object in writing this article is to record the success which has attended its use in my own practice and that of others, and to further and more completely illustrate its mechanism, that its simplicity and usefulness may be better understood.

## *Discussion.*

Dr. E. T. Darby. Those of you who have been in the habit of administering chloroform or ether, especially ether, to patients, and have taken advantage of the first stages of etherization in excavating sensitive teeth, know that it is of great value to the dentist in dealing with young and nervous persons.

Years ago, when I had more children to operate for than now, I frequently felt the necessity of etherizing my patients. Very frequently I would administer just enough to give them courage and to make them more manageable. I found the greatest benefit to myself and freedom of pain to my patients by putting them under the first stages of etherization.

Now, if one can carry this along with the apparatus of Dr. Fillebrown, it seems to me it would be a great help in dealing with patients, either men or women. There are some people, even men, as I know of a physician who will not submit to having a tooth filled that is at all sensitive until he etherizes himself; and he always demands a bottle of ether and an inhaler, that he may take some ether to have a sensitive tooth excavated. That seems almost childish; and yet there are people who dread pain so much that they would rather etherize themselves, and even submit to the nausea which sometimes follows the full anesthetic effect, than suffer the pain.

If we could keep our patients just about half unconscious on ether while excavating the teeth by this method, not anesthetizing to absolute unconsciousness, I don't know but it would be a good thing to put into our practice.

Dr. J. D. Thomas. I agree with Dr. Darby that for operations such as excavating sensitive teeth it would be an excellent thing. There is one objection to putting it in use in dental practice. Dr.

Fillebrown acknowledges that it is impossible, or next to impossible, to get a patient thoroughly under the influence of ether with the spray or with his current; so that it is necessary to produce anesthesia, first, by the usual method of putting a face-piece over the patient, and then keep up the anesthesia by his method after it has been established. In that way I think it would be a little detrimental to one's practice in filling teeth and working around the mouth.

I can very readily see or understand how, when the condition of anesthesia is produced to the point of unconsciousness, it could be very readily kept up; and it is an excellent method, in my mind, for doing so. It is not the ether vapor we want as much as it is the etherized air; and with an apparatus such as that I don't see why anesthesia could not be kept up almost indefinitely for operations in the mouth.

I hardly see where it is of any advantage to a dentist in the extraction of teeth, because it takes too long. I have, on frequent occasions, by giving nitrous-oxid gas, first brought the patient to a state of anesthesia, and then it has been kept up indefinitely by the administration of ether. It is a quicker and pleasanter way, by far, for operations extending over a length of time. By producing anesthesia by nitrous-oxid gas, it could be followed up by the etherized air which Dr. Fillebrown has introduced.

I should think the apparatus would be useful in long operations.

Dr. H. H. Burchard. I don't know anything, practically, about anesthetics. I have seen, however, as alluded to by Dr. Darby, the primary stages of anesthesia, before consciousness is lost. In the early stage of intoxication I have seen teeth extracted and minor surgery done, absolutely without pain and without any reaction at all.

Dr. A. H. Porter. Will Dr. Thomas explain why, in administering nitrous oxid, we are more successful when we give the nitrous oxid without any admission of air? That is, during its administration, not subsequently. Very often, when any air gets into the system we are unsuccessful, when with a continued current of nitrous oxid we have almost perfect anesthesia and are successful.

Dr. Thomas. In many cases asphyxiation can be obliterated entirely by the admission of a certain amount of air, the inhalation of the gas being not continuous, but alternated with air. The anesthesia will be more profound, if anything, and the patient will be under better control by the admission of a little air, during inhalation, than without it. If you exclude air entirely, you carry the patient to absolute unconsciousness. The convulsive action, the twitching and jerking, is entirely obviated by the admission of air to a certain extent. You can admit it according to the temperament of the patient, and it will relieve all jactitation, jerking, twitching, and convulsion, and the patient be carried into a profound state of anesthesia, much more satisfactorily than with nitrous oxid absolutely pure.

Dr. W. Booth Pearsall, of Dublin. Anesthetics have exercised our minds over on the other side of the water as they have yours on this side.

There are two schools of anesthetists at home. One contends that chloroform is the only road to salvation, and the other that ether is the only road ; but there is a mean between the two. It is not uncommon to find that a person with a large experience in the use of chloroform makes a bad mess in administering ether, and one familiar with the use of ether fails in administering chloroform.

A man who gives ether properly ought to have the patient ready in about three minutes ; sometimes I have seen it done in a minute and a half; it may go on for five minutes, but I think the time mentioned by Dr. Fillebrown is all wrong.

We use it in the dental hospital in Dublin a great deal for the extraction of teeth, more than nitrous oxid, and the reason is simply that it is so much cheaper to anesthetize with ether than with nitrous oxid ; nitrous oxid costs about two shillings a head, whereas ether is fourpence ; and, as we are all poor people, we have to take the ether. In operating, we issue directions to patients, so that we do not have the trouble in operating that we used to have. A patient purchases an anesthetic card beforehand and makes an appointment for a certain time in the morning, and they are recommended to come fasting, because it is a well-known fact that it is a great advantage in administering anesthetics. I have seen the most distressing scenes with patients who, if they had had the stomach empty, would have had no trouble at all.

In Dublin we are very fortunate in many ways, because we have some excellent administrators of anesthetics among the medical and surgical profession, and we have very few deaths in the year. We have not had a death—not more than one—in five or six years past; while in London, on the contrary, where chloroform is much more used than ether, they are having an epidemic of deaths. If you read the *Lancet*, it is lamentable how many deaths occur on the operating-table in London. I cannot tell the reason.

Dr. Hewitt, of London, has certainly made a great advance with the method which he uses. In the cases in which I saw him operate, there was no crying out or shedding of tears such as we often see. I think Dr. Hewitt has recently made his apparatus very portable—simply a bottle of oxygen and a bottle of nitrous oxid, with a little foot-piece with which you can turn it off and on, and a chamber for mixing it in. It used to be very cumbrous, but he now has it in a portable form.

My experience teaches me that if a man will give ether with the chloroform method, he will have trouble ; but if we have a chloroform man to give chloroform to the young and an ether man to give ether to adults, we can save a great deal of trouble and time.

I don't usually attempt anesthetic work in my office, but generally in a patient's room, because then, if the patient is sick at all, it is in his house and not in my room, and I think it is under more favorable conditions.

Dr. Levitt E. Custer, B.S., D.D.S., of Dayton, Ohio, then read the following paper, which was accompanied by a thorough practical demonstration by the essayist :

## Electric Heat in Dental Practice.

In the ordinary applications of heat, the gas and carbon products, while unpleasant and difficult to control, are not injurious, but in a few of the arts and some of the processes of dental practice the presence of these products makes it a serious matter. On this account we are glad to avail ourselves of a form of heat not new, but which has become practical only since the introduction of commercial electricity.

Electric heat differs from all other forms of heat in that it is not itself a process of combustion, neither is it a chemical action nor one of friction. It does not consume and does not emit. But, apparently without any cause, the conductor of the current rises in temperature and radiates this pure heat of which we avail ourselves.

There are three terms in electricity which represent its very foundation, the *ampere*, *volt*, and *watt*. These respectively represent the quantity, pressure, and power, and although frequently used synonymously are widely different. The ampere is the measure of the volume of current, or, we may say, the active principle of electricity, the working agent. It is that which produces heat, electrolysis, and magnetism. We may say it is electricity itself, and we speak of it as a quantity of so many amperes.

The ampere is of no value, however, unless it is in motion, and the measure of that force which puts it in motion is the volt. While all so-called conductors of electricity allow electricity to flow through them, they at the same time offer more or less resistance to its flow. To overcome this resistance there must be some force from behind, and this has been termed the volt. For this reason we speak of a current at so many volts pressure. The incandescent lamp glows because the ampere of current is flowing through its filament; but at the power station the dynamo is forcing the ampere in at 110 volts pressure, enough to carry it to the lamp and through its filament.

The watt is the term for power, and represents electric energy. It is the aggregate or summing up, in one word, of the output or consumption of electric energy. It is the product of the amperes multiplied by the volts, and is readily converted into what we call horse-power by considering 746 watts to be equal to one horse-power. It does not matter how the watts are made up, whether more of volts or of amperes, so long as their product equals 746 it is one horse-power. A current of 75 amperes flowing under a pressure of 10 volts will do work equal to about one horse-power, or a current of one ampere at 746 volts will produce one horse-power. A 16-candle-power lamp consumes 55 watts; at 110 volts that would be half an ampere each, and thirteen such burning at one time represents an expenditure of one horse-power.

The heating element of electricity is the quantity or amperes. Volts do not heat, they only force the quantity through the conductor. If it requires six amperes of current at two volts to heat a cautery loop an inch in length, the same quantity of current at 110 volts would heat a piece of the same wire 55 inches in length. You will recall an electric exhibit at the World's Fair in which a bar of iron an inch in thickness was heated to redness in a few minutes. This was done by forcing through possibly a thousand amperes of current at a few volts pressure. Such a current is not dangerous to life because the body offers so great a resistance that the few volts cannot force the amperes through.

Besides the quantity or amperes, electric heat also depends upon another factor. There can be no perceptible heat unless the current meets with resistance to its flow. As the quantity is increased the heating power is increased, but this power is not apparent until the current meets with some resistance. The unobstructed flow of any quantity of the fluid does not produce heat. It is only when a poor conductor of electricity is placed in the circuit that we have this manifestation.

Electric resistance is of two kinds: the resistance of the material of which the conductor is composed, and the cross section of the conductor. All metals are comparatively good conductors of electricity, yet these vary in their conducting property. Copper stands at one extreme and German silver at the other. In the electric gold annealer and porcelain oven platino-iridium wire is used, because it is a poor conductor, and does not oxidize or readily melt.

The size of the wire is the other factor in the determination of the heat. With a given length of wire the resistance increases as the diameter of the wire decreases. That is, a small wire has less carrying capacity than a large one, so that when the same amount of current that is easily conducted by a large wire is forced through a small one, the condensation, I will term it, produces heat; so we would say that with the same quantity of electricity at a given pressure, heat is produced according to the resistance of the conducting agent.

The atmosphere is practically a non-conductor of electricity, yet under certain circumstances it does allow the passage of an electric current. When a current has been established by bringing two terminals together, the electricity continues to flow, even after the ends have been separated. It leaps the intervening thickness of air in the form of the voltaic arc, and continues until the distance becomes too great. This action develops so much heat that it has led to the supposition that electricity is another form of heat. When the oppositely electrical clouds unite it passes through the atmosphere as lightning; when the Leyden jar discharges it is the spark; or when it lights the street corner it is the arc. The heat of the arc is so intense that by our present methods it cannot be measured, but is estimated at 6000 degrees Fahr. With the ordinary Edison current I find that we can not only melt platinum and iridium, but in small quantities we can vaporize them.

Electric heat, when obtained by heating a conductor that does not oxidize, differs from other forms of heat in that it is without gas, noise, or odor, and on that account is of special value in dental practice. Electric heat also differs from that obtained from other sources in that it can be controlled and regulated with the utmost precision. A given number of amperes, forced through a known conductor at a given pressure, always produces the same amount of heat, and it is possible even to calculate beforehand precisely how much heat will be developed by the different arrangement of volts, amperes, and resistance.

No case in dental practice, or in any other practice for that matter, calls for a blast of air exactly at blood temperature, so much as an almost exposed pulp. And no instrument so nearly meets this requirement as the electric warm-air blast. With air at a constant pressure, which is carried over electrically-heated wires at a constant heat, the air escapes from the syringe-nozzle at a uniform temperature. The heat can be varied by the operator in three ways: by manipulating the air-pressure, by altering the electric heat by means of the rheostat, or by varying the distance of the syringe-point from the cavity. After a little experience, the operator can dry out the cavity without the slightest pain to the patient, and, if the air has passed through a wash-bottle of alcohol or any such agent, it carries its vapor with it.

The cautery and electric root-drier are both familiar to you, and are examples, on a small scale, of the heating power of electricity. These instruments can both be successfully operated on the Edison current by throwing in about ten ohms resistance and taking off the cautery heat by what is known as a "shunt" current.

The value of any heat for sterilization is duly recognized, and for some time I have been satisfactorily using the electric oven, raised not quite to the heat of withdrawing the temper of the instrument. The heat may be maintained all day long, and the cleanliness and simplicity recommend it. Gutta-percha is softened with accuracy, when placed on a soapstone slab resting on the oven, and the waste heat rising from the whole appliance is utilized for keeping water warm for the syringe.

There are two processes in dental practice which call for absolute purity and uniformity of heat. Upon recognizing the special fitness of electricity for meeting these conditions, I some years ago devised an appliance for annealing gold thereby, and one more recently for fusing porcelain.

The heat produced by electrically heating a mat of coiled platinum wire is the cleanest, most uniform, and most accurately controlled of all forms of heat. The cohesive property of pure gold is supposed to be developed by heating to such a temperature as to drive off the gases condensed upon its surface, principal of which is ammonia. The alcohol and Bunsen flame are ordinarily used for this purpose, but who is certain that better results may not be obtained by subjecting to a heat free from the products of combustion as well as to the danger of smoking and the exposure to unconsumed gases? The electric annealer effectually overcomes these dangers. The heat, being derived from electrically-heated platinum, itself a noble metal, is absolutely free from gas of any kind. The heat is radiated from a mat of platinum coils and is quite uniform at all parts, so that the gold is not only thoroughly annealed, but it is evenly annealed. It is impossible to evenly heat a piece of gold, held with a pair of pliers, over a flame of any kind. The thin edges of the gold will be fused, while the part between the pliers will be scarcely warm. The accuracy with which electric heat can be controlled also recommends its use for annealing. By means of the rheostat, any degree of heat to the melting-point of platinum may be obtained. From my experience with the electric annealer, however, I find that cohesion is developed at a much lower degree than at first supposed. It is never necessary to heat even to redness, let alone fusion. The heat may be so low that the gold may be subjected to it for hours or for days, even, without any injury, and still be highly cohesive.

Electrically annealing gold saves time in many ways. The gold requires no attention, is ready for use at all times, and the heat not being high enough to take the temper from the plugger-point, this instrument may be used to pick up the gold, thus saving the time of changing instruments. After six years' use, I am free to say that next in usefulness to the dental engine is the electric gold annealer.

The latest practical application of electric heat in dental practice is the electric oven for fusing porcelain. From the time of Allen and Hunter, or from the very beginning of porcelain work, the question of heat has been a serious one, and the principal reason that continuous gum has not been more popular is the difficulty and uncertainty in the production of heat. The heating principle of the oven is an electrically-heated platino-iridium wire, or the gold annealer in the form of an oven. In using this new source of heat, I departed from the old muffle-shaped oven to one more in keeping with this new agent. It consists of an upper and lower section, flask-shaped, with an inner cavity amply large enough to contain a set of teeth, and of such form and arrangement of the wires that all parts receive the same degree of heat. Upon the whole inner surface is imbedded the electric conductor, just deep enough to be supported while so highly heated, and yet to radiate its heat directly into the oven cavity. The upper half is hinged to the lower, which automatically makes the electric connection upon being closed. There are two openings through which the fusing process may be watched. These are placed at such positions that rays of light entering one will be reflected out by the plate through the other. This overcomes the intense glare of the heat, and at the same time brings the plate clearly into view, making it possible for an inexperienced operator to accurately determine the degree of fusion.

There are many other advantages offered by the electric oven.

The source of heat being a noble metal electrically heated, it will be readily seen that a heat is obtained that is unlike any heretofore used for this purpose ; and since it gives rise to no products of combustion, it is an impossibility to produce what is known as "gassing," and porcelain fused by this method not only possesses unusual clearness, but appears to be more dense.

The accuracy with which electric heat can be regulated by means of the rheostat, the cleanliness and simplicity, freedom from noise and odor, are advantages over the older forms. With electric heat we have something definite. It is not affected by bad coke, by bad oil, by gas, or unequal draught. A given number of amperes forced through a conductor at a given pressure produces a heat as definite and results as positive as a rule in mathematics.

We can control electricity, and the opportunity is now open for any number of automatic appliances to regulate the heat according to the porcelain treated. I have, up to this time, devised a clock attachment to the rheostat whereby the current is gradually raised and cut off at a set time. Second, a fusible button of porcelain placed in the oven at the time of fusing, which rings a bell when the porcelain fuses. Third, an electric thermometer, whereby the temperature of the oven is quite accurately told by the rise of mercury in the tube. And fourth, an ammeter, the swing of whose arm is in proportion to the heat of the oven.

These appliances are mechanical and quite accurate ; but it is such a pleasure to sit down and observe the different stages of fusing that the experienced operator, who has had to handle his case at a distance and with so much anxiety, takes delight in watching and varying the heat at will, as he would play with a toy.

The cost of operating is very small indeed. The oven, as now made, consumes six amperes, which would be about two cents per fuse of thirty minutes.

In case a wire should burn out by accident, this break in the current automatically cuts the current off, so that no further damage is done, and it requires but a few minutes to repair the break in a way that is as good as new.

While the electric oven operates best when used on the Edison current, it is still very satisfactory on the 52 volt alternating, the 220, or the 500 volt currents.

In the practical operation of the oven the procedure is very simple. The case is placed on the tray in the lower section, and the upper is then closed down. The lever of the rheostat is placed on the first button, and heat for thoroughly drying out the case is quickly obtained. When the operator is satisfied that there is no more moisture present, he begins raising the heat by pushing the lever to the right. If he allows two minutes to each button, it will require from twenty to twenty-five minutes to reach the fusing point. If it is a crown or bridge, less time may be consumed in raising the heat without danger to the case, and it may be fused in from ten to fifteen minutes by throwing the lever over more rapidly. In practice I do not even measure off the time to each button, but fuse while I am operating. From time to time, as it occurs to me, I throw on two or three buttons at a time, according as the interval has been, until I have reached the third from the last button, on which it is allowed to remain until I have three minutes in which to give it my undivided attention. The porcelain is just ready to drop into a fuse, and upon throwing on the last button the successive stages and degrees of fusion are clearly made out.

In the first stage the porcelain is still in the powder form, and appears like snow ; presently it begins to drop into a fuse, and the snow-like appearance changes into a dead, indistinguishable mass ; the particles are now beginning to coalesce ; gradually the surface, with all its inequalities, comes clearly into view, and presents a glistening appearance ; continuing the heat a moment longer, the porcelain becomes more liquid, and the inequalities of the surface assume a more even appearance. Since the eye can be brought so close to the plate with the electric oven, and since the plate is brought clearly to view by the arrangement of the two sight openings, the operator is not guessing by the quantity of heat or the general appearance of the plate, but he is actually observing the different particles of the porcelain itself ; and for that reason the fineness of his fusing is always assured, and under his perfect control.

When the desired heat has been obtained, the lever of the rheostat is thrown back, which cuts the current off. At that very instant the heat begins to go down ; so that there is neither over-fusing, nor loss of brilliancy in the gum color. If it is the first or second baking of the case, the stoppers need not be inserted, and the case can be taken out in a short time ; but if it is the last fusing, after a few moments' time has elapsed and the case has become a dull red, the stoppers should be inserted, and the case allowed to gradually cool.

It does not matter how nearly I have approached the ideal the prosthetic dentist has long sought, in the invention and perfection of this appliance ; there will be some who will find objection in some particular. It is but just to mention, however, that the objections have all come from persons who have not examined into the practical working of the instrument, but have stood afar off with forbidding gestures.

A prominent porcelain worker says it will be impossible to fuse thick portions, as well as thin, in such an oven. To that objection I would answer, that in the old form of muffle it would be possible to do that ; but in an oven which radiates its heat equally from all directions, as the electric oven does, the reasonable thinker will acknowledge that the thick would be fused equally as well as the thin, especially when we bear in mind that the porcelain is in the form of a powder, light and loose, before it fuses, so that the thicker portions are permeated by the heat as well as the thin ; and practical tests prove this statement to be correct.

The older practitioners, who have been accustomed to working with large ovens which retain their heat for a long time, insist that the case must be taken out and put in an annealing oven. To those persons I would say, it can cool in the oven just as well ; not only that, but the case is not subjected to a sudden change of temperature, as must certainly occur when removing to the annealing oven ; and on that account we claim it is rather an advantage to have the case remain in, and all cool down together. To those who think they must still do this, however, I would say they can easily do so until they find it unnecessary.

There is a common objection, that it is an electrical instrument, and, like many such appliances, is liable to get out of order ; or that it requires an electrician to operate it, and therefore will not have it about. To that objection I can only say that it is much less complicated than a motor, and any one who is reasonable can operate it. On account of the special fitness of electricity in dental practice, it is becoming late in the day for any person to acknowledge his inability to take up the common applications of electricity, or to forbid their adaptation in his practice on general principles. He should bear in mind that we are not to-day dealing with the uncertain batteries of the past, but with the certain results of that Llewellyn genius,—Edison.

It would seem that electricity has given us all we could ask for ; and yet I am forced to say that the properties and applications of electricity are just unfolding, and the demands of dental practice of the future will keep pace with, if not in the lead of, electric progress. It is not a dream when I say the time is coming when electricity will have its place on the dental curriculum as much so as materia medica or metallurgy has now. No profession, science, or art has such varied demands in its practice as dentistry, and no single agent more nearly meets these than electricity.

After a vote of thanks to the essayist for his interesting exhibit, the meeting adjourned.

A regular meeting of the Academy was held Tuesday, Oct. 22, at which Dr. BURCHARD, by request, gave in detail his method of making porcelain-faced crowns, which was generally discussed by the members present.

Under incidents of office practice the subject of implantation was presented by Dr. E. T. DARBY; and as so much interest was manifested in the topic and the present status of the operation, Dr. LOUIS JACK volunteered to write a paper upon the subject for the December meeting, which it was agreed should be especially devoted to its discussion.

Adjourned. GEO. D. B. DARBY, *Secretary.*

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## TRI-STATE DENTAL MEETING.

(Concluded from page 953.)

### THIRD DAY.—*Morning Session.*

THE meeting was called to order at 9.30 A.M. by Dr. W. P. MORGAN, president of the Michigan Association.

A paper was read by Dr. M. F. AULT, Kokomo, Indiana, entitled:

### FOUR REQUISITES IN DEVELOPMENT.

The essayist in alluding to the fact that the process of true education in dentistry has much yet to perform, held that the conflict of the future will be as in the past,—a struggle between truth and falsehood, intelligence and ignorance, honor and depravity. Reviewing the present situation and comparing it with a practical ideal, the elements which enter into our experience and influence our opinions and consequent actions are as follows:

1. The Novice or Embryo.
2. The College.
3. The Profession.
4. The Professional.
5. The People.

Now, the inharmonious relation of these elements has made bitter the experience of the past, and the substitution of a harmonious relation will be the occasion for controversy and upheavals as well as to inspire us with the sweetness of ultimate success. First, the novice of the past, with his crude notions, knocked for admission. He moved on the low plane of a money basis. Sought the most for the least service, and, with few exceptions, passed an uneasy life and finally closed his office to be hurried through the Eternal Gate, clothed in that mantle which the caprice and selfishness of the world is prone to weave. The novice of the future will be of the same character, except the modification which we expect through the direct and reflex influence of true education. We want him to know that when he knocks at our door, he is asking admission into a sacred dominion. That he is helpless on account of his ignorance, that he is dust and soon to mingle with the elements, that he is in distress and needs some one to show him the true way. Second, the colleges of the past and present, while maintaining an apparently innocent front, have worked too much on a revenue basis, have too often prostituted themselves for money, and thereby augmented the ranks of those whose motive is impure, whose action is demoralizing, and whose touch is fatal.

Among the elements which enter into our experience, one is faultless, and that one is the profession. I refer to the profession not as so many individuals, but as a list of entities which constitute the grand total of discovered and undiscovered dental knowledge. It contains the truth of the past and future. The truths of a profession are of Divine origin; they constitute the relentless laws which are not penned by human hands. Laws which are abiding as the eternal throne, because they are not characterized by human frailty and lobbied through a weak and vacillating legislature. Who is it that is not aware of the law of inspection in the human eye, the law of touch in the human mouth, the law of pain in the human teeth, and of speech in the human tongue? What man does not quail when he undertakes to reproduce nature and introduce his handiwork to the delicate sensibility which pervades the oral organs? These laws were enacted on that day when it was said, "Let us make man in our image." This is the imperial edict before which all must bow, and in it we see the safety of our profession. These statutes may appear merciless, but their truths touch a cold heart and transform it into a center of sympathy; touch a benighted mind, and reveal the knowledge of Divine power; touch the eye before which flit ignoble visions, and open it to the light which shines from a pure throne; touch the ear in which have lodged the notes of beastly composition, and make it sensitive to pure song and righteous instruction.

Three essentials must be considered before the college can meet the expectations of the times:

*a.* Specific Scientific Instruction.
*b.* Specific Manual Instruction.
*c.* Specific Soul Instruction.

We wish to place particular emphasis on the first, because we are wandering in the scientific department, and the pupil is failing to see the relation of much of our scientific instruction to his development. In the second, or manual department, the difficulty is in keeping each section profitably employed; and the third, or soul instruction, is usually ignored.

*a.* Specific Scientific Instruction.

Specific means definite, particular, distinctive, special.

Scientific pertains to accumulated, systematized, established knowledge, and, in our teaching, refers to physiology, anatomy, chemistry, etc.

To illustrate the topic of specific scientific instruction, we will use the first branch named,—physiology.

We think the power which enforces scientific investigation can be vindicated, and, if not, the school must be one of manual training. Physiology we will divide into two parts:

1. Structural—Histological.
2. Functional—Vital.

And in the following synopsis we will exhibit the scope of physiological study for a dental student:

Physiology of the Teeth.

1. Structure
   1. Physical
      1. Hard
         1. Enamel.
         2. Dentine.
         3. Cementum.
      2. Soft
         1. Pulp.
         2. Peridental membrane.
   2. Chemical.
2. Nutrition
   1. Proximate elements.
   2. Digestion.
   3. Secretion.
   4. Absorption.
   5. Circulation.
   6. Respiration.
   7. Animal heat.
   8. Excretion.
3. Relations
   1. Vascular.
   2. Nervous.
4. Function
   1. Immediate.
   2. Remote.
5. Anesthesia
   1. By internal agency.
   2. By external agency
      1. Medicinal.
      2. Hypnotic.
6. Reproduction of.

It is not the purpose of the writer to give a lesson in histology or physiology, but to demonstrate his method of teaching. Notwithstanding the desire that I always feel to have my pupils appreciate this branch in all bearings, my sole study is to emphasize its relation to their calling, hoping that this would prove an incentive to general investigation.

To state to a class that white fibrous connective tissue, nerve-tissue, blood, blood-vessels, lymphatics, unstriped muscular tissue, and cells are to be subjects for study, awakens but little interest and inspires fear. But, first, to illustrate, by a large figure that can be seen from all points in the room, showing care and skill in using the crayon, that a tooth is suspended in its socket by fibers of white connective tissue; that immediately surrounding the cementum is a very peculiar form of lymphatic; that about half-way between cementum and alveolar wall is a zone of nerves and blood-vessels, and from the blood-vessels a spherical, nucleated cell works its way, and by its differentiation it may become a builder of cementum, a fibroblast, a bone-forming cell, or an osteoblast.

The learner is at once intensely interested and confidence established, not only in the teacher's ability, but in his own capacity for receiving and assimilating the subject. He is interested because he sees from the drawing that the explanation refers to vital structures within the field of his future operation, and confidence in himself is secured by the large diagram fixing in his mind the points of size, shape, color, direction, location, relation, name, and everything so suggestive as to almost reveal the function of each element.

### *Specific Manual Instruction.*

This pertains to the clinical department of the college. Here the student is brought into contact with a text that feels pain, passes judgment, and returns generally a just verdict. Here the student stands in doubt and realizes his weakness. His eyes are opening to the fact that no man can understand a doctrine till he applies it to his own life. He is engaging in something that tests nerve, sympathy, integrity, and judgment, and is made to feel in the deepest sense that to experience the highest pleasure he must express himself in a perfected object, and to illustrate his worth he must construct, he must build something which will stand criticism, mechanical forces, and chemical changes.

Now, to stop generalizing, I will ask, What makes the practical departments of a college such a task? I think we can say that it is due to things not being in the proper relation. The inexperience of the student, the essential demands of the patient; the need of the student for full employment, the scarcity of clinic material; the need in a demonstrator of executive ability, and the scarcity of competent help for a demonstrator; all these are instrumental in preventing the proper relation. Then, to overcome the causes of improper relation is the problem. We have before us certain principles which are sometimes designated as systems. *First.*—The learner must make something useful from the beginning. This means that a student without knowledge of instruments, preparation of cavity, condensing of material, must be placed in charge of one wanting any line of work done in the mouth, subject, of course, to the inspection of some superior.

*Second.*—A drawing which represents principles or work on an extracted tooth is the first step, and construction by fulfilling the conditions of the drawing is the second step; this work being done in the mouth. Some very good teachers think the first system is the one to follow, while others are in favor of the second. One or the other of these principles must be recognized in engineering the practical work. I think, from the perusal of college announcements, that nearly all are basing their management on the second principle, not especially by having students draw a cavity which sets forth principles of its preparation and the placing of gold, but in having them work on extracted teeth. It is so common to read that, during the freshman and probably half of the junior year, the student imbeds extracted teeth in plaster or modelling compound, and learns the use of instruments and preparation of cavity. Then he is introduced to actual work in the infirmary. Students are coming to think that this is right, and that there is not enough of it done. I wish to respectfully offer an objection: work on extracted teeth is only of value in studying their anatomy and histology. A student *must* meet *actual* practice, and when he does it is under such conditions that no work on a dead, disassociated tooth would thwart the embarrassment when the hour of trial comes. We all know the relation of teeth in a superior jaw, and their occlusion with antagonists; the difficulty of applying the dam, excavation in fixed localities, appearance of an exposed nerve or one nearly exposed, the display of uneasiness on the part of patient, and the resulting sympathy on the part of operator. These are some of the conditions under which *actual* work *must* be performed. Can a student ever learn it away from the chair? I think not. Then certainly the time to begin is in the beginning. I believe an adoption of the principle of putting students to work at the opening of the freshman year would reveal wonders in the course of three years. This would necessitate close application to the student by the teacher, but not more attention than any other time. Beginning at this time will create a fair operator by the time that most are allowed to begin, and by the close of the junior year the college would be assured of an able class from which to select help when they become seniors. This abundance of able demonstrators will manifest itself on other beginners, and the infirmary turning out better work will certainly increase the number of clinics. So, taking the freshmen as soon as they enter, and giving them the proper attention, will certainly result in doubling their efficiency, will double the capacity of the department for able demonstration, and this will double the clinic attendance, because the work turned out will attract the same as good work from a private office. This all being true, it would make the efficiency of candidates for graduation many-fold greater.

### *Specific Soul-Instruction.*

This pertains to the spirit which pervades the labor of life, and no student should be admitted into the precincts of the dental profession until his soul is in harmony with that Will which has blessed us with our present advancement and still leads us and directs to higher attainment. We believe that the sphere of our efforts, in its truest sense, is a part of the realm of truth. We believe that the strength and firmness of dentistry lies in our unity and unbounded devotion to it. We believe that we must manufacture a true sentiment as a portion of posterity's legacy, and also there is a spirit with which we must become imbued, and swear to make the development of the power of our profession our prime aim and accessory to the eternal life.

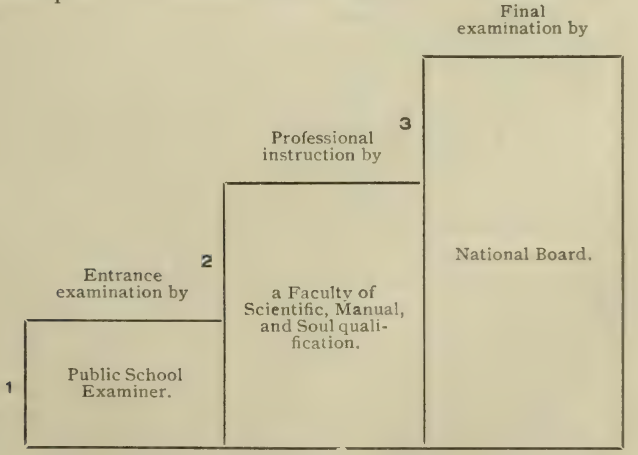
Now, what I mean by soul-instruction in a dental college is not to make the rostrum a religious pulpit, but to arouse from that passive, non-committal way in handling deductions and conclusions after scientific investigation.

This is a day in which we hear much about science, and we talk about great medical exponents; and a great deal of the talk is so inflected as to convey the idea that medical education is considered from a skeptical standpoint. It seems to me that it has grown to the extent that the laity has the opinion that to enter a school where any part of medicine is taught is to become a spiritual blockhead. Judging from the remarks of many teachers who are posing as scientific leaders, the student would enter a medical or dental college feeling that a nature gnarled and tainted with disbelief is necessary to stem the cold, unsympathetic, and Godless atmosphere.

I mean by soul-instruction to direct the work so as not to beget a monstrosity. We have in our faculties too many self-styled rationalists, and in my experience I find no one more unreasonable than the man continually clamoring for reason, so I would teach a class that exclusive training results in disproportion. A student must know that he is related to a business government, which we will subdivide into *Ethics*, a system of principles concerning duty,—this force originating in associate work; *Retribution*, a reward for good operation and punishment for bad,—this force originates in the patient;

*Legislation*, those legal enactments which state the condition of practice,—this force originates in the people; *Administration*, the manner of teaching and practice,—this force originates in the college and private practice. The student must also feel that in his better nature certain qualities should take root, and be trained to full development. These are numerous, and we will only attempt a synopsis. *Physical Qualifications*:—good health, good eyes, well-kept person, clean and steady hands. *Intellectual Qualifications*:—accurate knowledge of the branches in his business, interest in the moral, religious, and political affairs of mankind, interest in current events. *Professional Qualifications*:—correct idea of work, intimate acquaintance with educational means, tact in management, and insight into business.

The *fourth requisite* in professional development is sufficient strength of character in some college to pass through a needed transition. I think there is a call coming from this age, and some college must respond. The college which is willing to submit the entrance qualification to a disinterested examiner from the public schools, to have its course of instruction strong enough to be able to submit the question of graduation to a national board whose sole purpose would be to replenish the profession with true ability, is the college which will demonstrate the needed transition, and in the most significant manner answer the call of the age. This would, in the truest sense, be a national dental college. After a conservative survey of the situation, I would have all future aspirants enter the profession by three steps. I illustrate in this manner:



### *Influence on Students.*

Let us next examine the feasibility of this plan. According to the first step required, no holder of a medical diploma or certificate from another dental college (not of equal requirement) would be exempt from examination. Then all applicants must pass the literary test in the common English branches before a disinterested examiner, except holders of a two-years' teacher's license, or diploma from high school, college, or university. This requirement would rule out at least twenty-five per cent. of the candidates for admission. Is there a reason for continuing in the popular way, that vitiating way which is practiced by colleges which talk much about repute? Let every one who has addressed a class containing twenty-five per cent. of illiterates, every teacher who has inspected the papers of unqualified students, every secretary who has gone through the disgraceful sham of entrance examination, every professor who has, for his head's sake, his purse's sake, or because of his own stupidity, sanctioned the graduation of many incompetent men, answer whether there is any reason for transition, and the best means of securing absolute silence with reference to the phrase "good repute." Some may say, Where would you get your students? I have, during the preparation of this paper, interrogated several students, and their countenances invariably bore a smile of approval. Their utterances were, "That is right," "I would like a diploma from such a school." The fact is, human nature generally is seeking the best, and will gladly submit to a discrimination which is clearly based on merit. A fair, certain, and unflinching test for admission, and graduation when the applicant is able to pass a fixed standard of excellence, is the only reputable, professional, and just basis for issuing a diploma. Students with advanced and practical ideas cannot apologize for a system which awards the same diploma to all students. They say, I am not able to determine whether my diploma signifies anything; the same form was granted to those who stood lowest and those who ranked highest; and the lowest made bad records in attendance, attention, deportment, punctuality, recitation, and application. So it seems that all the management is interested in is the tuition; they admit us for money, and graduate to get rid of us. It is evident that every student expects to pass, and it is felt to a certainty that the faculty cannot refuse to graduate unless there is a very unusual violation of rules. When we first read the catalogue, we thought a standard in literary training had been adopted, and that students measuring up to a certain per cent. would be admitted; but we were much surprised to find no examination, or, what there was, an abject subterfuge, the meanest evasion, a forlorn artifice.

We all attend the same time, three years. Some are faithful and able to master the course in half of three years; others are stupid and indifferent, and need three years, and probably five; others are a drunken, beastly set, and could not pass short of ten years if application to a problem which must be solved is the right requirement. We are certain that if a pupil could be eligible to an examination before a national committee upon recommendation of the faculty, it would be justice to those who work hard and feel the need of saving time and money. Also, it would prove the greatest incentive to the mediocre, and a fair warning to those who are willfully stupid in brain, hand, and professional spirit.

### *Influence upon Faculty.*

Let us ask next the influence of such regulation upon a faculty. A faculty certainly labors under embarrassment by having no recognized standard. Each state is fixing its own requirements. Each faculty is teaching largely at random. Each member of a faculty is left to his own option in what he teaches. I mean to say that all dental institutions ought to move around a common center. A convention of competent men ought to define the limits of anatomy, physiology, chemistry, and materia medica for a dental college ; this convention to take our works on operative and mechanical dentistry and select from them the best, giving full credit to the author in the parts chosen, and this compilation to constitute the *Standard Text-Book* in these branches. Treat other branches the same, then faculties will know what to teach, the student will know what to study, and the national examiners will know what has been taught and studied, and from which source to select proper test-questions. This single standard will give uniformity, equality in recognition and respect, and all move around a national common center, instead of as many centers and standards as we have states and colleges. Under our present plan a member of a faculty would say, I select what I want to teach, and my students ought to have their final examination based upon the instruction given. Under our present plan the work of one chair may lap over on to the work of another chair, or repeat and antagonize the thought of a preceding lecture.

Under our present plan one department may say, I make no effort to do certain work. I am to teach thoroughly what I do teach, and let the rest go.

Under our present plan an instructor is as tardy as he wants to be and irregular in keeping appointments, offering as an excuse that the students are glad to get out of it, or that he had other business, thus making college duty secondary to whim and private affairs.

I claim that a member of a faculty, if given a standard course to follow, would talk less, think to the point, be more prompt, and give the learner the closest personal attention, because to show that tact and qualification which is necessary to polish the student and make him feel the force of all that is said in a standard text-book would determine the reputation and value of a teacher before our highest authority. Reputation would not be left to the caprice of a class of students who seek the least resistance and the desire of a teacher to be solid with the class by being called easy. He would say, Gentlemen, we must all work ; faculty and students must all work, because the national center prescribes the amount of work to be taught, and this is to determine my reputation and your graduation. The day of talk, talk about what you please, and as long as you please, upon things relevant and irrelevant, irregular as you choose, and keeping students in subjection by boasting and swelling, has ceased. The day of *merit* is at hand for all.

Now, as one engaged and interested in the daily duties of private practice, I will briefly give the dimensions of the mold in which the next graduate should be cast—of course not attempting to state the table of contents for any standard text-book :

(a) Arrange so as to eliminate all superfluity. There is too much lecturing.

(b) Selection of men who are willing to work more and talk less, and do it without lamenting that their private practice is suffering. I mean the selection of faculty.

(c) Whenever the student is well acquainted with the anatomy of the head and internal viscera, by taking the scalpel in his own hand, using his book as a guide, and a demonstrator to make clear that which is not understood ;

(d) As soon as he has applied himself to the histology of the various tissues by placing his own eye to the microscope, using his book as a guide and a demonstrator to clear up all ambiguity ;

(e) Whenever he is in full sympathy with a teacher whose knowledge of physiology enables him to reveal the forces of life ;

(f) As soon as he has seen, touched, and tested the qualities of medicines used in dentistry ;

(g) Whenever he has mastered the chemistry that may have bearing in dentistry by taking the test-tube in his own hand, with a careful leader to tell what to do and what is expected from the experiment ;

(h) As soon as he has been placed in full relation with disease about the teeth by the oversight of a careful diagnostician ;

(i) Whenever he can take instruments and material and prove that dental restoration and dental substitution is a part of his being ;

(j) And whenever (whether it be one or five years) he proves it all to the satisfaction of a Central National Authority, he should be graduated, and his diploma will have a value which can never be given by a fickle, sympathetic faculty,—can never be given by a state board, which is very apt to be partial to its own state, but will have the added value of national indorsement.

This being the order, we would no more see the dissecting-room a place of hilarity, irreverence, and random cutting. Surrounding a body which was consigned to the tomb probably forty-eight hours before, amid the tokens, tears, and agony of that well-known occasion, the student would deport himself as a representative of science, instead of being a barbarian and lost to all decency and sympathy.

This being the order, we would no longer visit laboratories and infirmaries seeing only those present who choose to be there,—those that are there fumbling after something they know not what,—absence of system, general irritability, the demonstrator late or absent, and the one selected for his place chosen because of excessive bravado, giving his opinions as facts, when, in reality, the big-head is all he has to exhibit.

This being the order, we will never more enter a lecture-room to hear the professor prove that *he* has a good lesson, the student dazed by fluency on ridges and tuberosities, the time wasted, and the learner injured in his effort to carry an indiscriminate mass in memory ; but the instructor will guide, and the pupil will prove that *he* is the one that has his lesson.

### *Influence upon the Profession.*

Such a policy would certainly meet the approbation of members of the profession. A plan like this, submitted to a man in private practice, would be judged according to his first training, the bent of mind at the time the question is submitted, his insight into the need of advancement, and his capacity for grasping results. One would say, That is so far ahead of anything that I had ever considered as practical that it stuns me ; five minutes after he would say, It is taking root, it grows on me ; one day after, That is The College : let us incorporate.

No method of college management should be indorsed, unless it can stand the test of common, every-day reasoning, and it requires no strain of the imagination to see that every dentist in practice would decide that that plan will guarantee,—

(a) Competency in graduates.
(b) Extinction of professional harlots.
(c) It will limit competition.
(d) It will force the college to serve the profession.
(e) It will drive the drones from faculties.
(f) It will enable us, without blushing, to say Good Repute, and rescue us from the fatal stench which envelops us.

As a man in private practice, I ask whether a private corporation (and many colleges are such) can conserve their own interests and the profession's interests at the same time. A private corporation wants, on account of its need and its desire for gain, all the students it can induce to come. The profession, on account of its need and desire for efficiency, seeks restriction and the highest development. A private corporation is apt to have a passion for power, and power more often hinges on money than actual service, and we would say nothing about money if it was impossible to compromise.

The profession (in the sense in which I use the term) has a passion for uniformity of service and equality in reputation and respect, also freedom from humiliating and destructive strife.

A private corporation is legally placed at the head, and the replenishing of our ranks is left to its will; it holds the key which locks and unlocks the door through which every entrance is made into our domain. State boards cannot control, because they are too often a part of the corporation.

The profession has the unquestioned right to think, and this inherent right should be freely used in investigating methods, policies, and motives before becoming an instrument in securing legal enactment for a private institution or recommending a student to a college with questionable regulations.

At present, if one hundred young men decide to follow our vocation they expend thirty-two thousand dollars for information before they can feel within the pale of security. Are they safe? Does their information fortify? Is the highest and best vindicated? or does a retrospection mortify? Now, have I conveyed the idea that our colleges are not performing their function, *i.e.*, furnishing the various communities with men who know they are skilled and without tremor of hand, huskiness of voice, or beaded brow can secure confidence,—men who can convince an old practitioner by showing diploma that help can be employed without feeling that a burden has been added to the office. When a man employs help he wants to feel a transfer of responsibility, and the presentation of a diploma ought to be a sure guarantee that the required help can be found in the owner of a diploma. I mean, then, to assert (being also able to prove) that our present college system is not performing its function, basing my assertion on and finding my proof in the self-evident truth that *only thoroughly reliable men should be holders of diplomas*.

I hold that much more can be added to our professional interests than the usual disbursement of thirty thousand dollars secures. I must earnestly recommend a merit system applied to both student and faculty, and a national board to sit in judgment. This is perfectly feasible, and all that is required is a voluntary acquiescence on the part of colleges, or for the legislatures to take the entrance and final examinations out of the hands of interested persons. As I write this, a recent New York enactment is handed me. May 11, 1895, the Governor approved a law which makes dentistry an integral part of medicine. It provides that after 1897 a full high school certificate, or its equivalent, shall be necessary for admission, and places the entrance examination under the board of regents of New York University and final examination under the state examining board. I mention this to show that my fourth requisite is not extreme in its requirements as to admission, and leads in the method of determining fitness for graduation.

### *The National Regents or Examiners.*

What principle should govern in creating this body? I think the idea that the profession is supreme to all other interest. Let it be understood that the profession is one thing, and colleges and personal matters are positively other things. Personal interest must be made to serve, and colleges be subordinated to professional management.

The *state associations* belong to the *profession*, and should always be over the *college*. The state association and college should work together,—the association governing and the college filling only honorary positions; *i.e.*, the association should furnish the college an opportunity to prove to the profession that there is reason for its existence. This would tend to make associations popular and assert their natural rights, and out of it would spring the influence and power to create and sustain the national authority by popular methods and the democratic principle of governing. To recapitulate, —the novice, college, profession, professional, and people constitute the elements of dental experience, and the foregoing comment places the college in the very responsible position of determining the future status of dentistry. A port, if properly fortified, prohibits the landing of an enemy; but if the walls are low and the garrison small and poorly equipped, plunder and devastation is sure to follow. This is the relation of the college to the domain occupied by our brethren. Every one who entered the French Pavilion at the Exposition was certainly impressed with "The Guardian Spirit of the Secrets of the Tomb," and each, as he looked upon the powerful arm which embraced the urn of ashes, had his own revery and made his own application. After placing myself in full sympathy with the sentiments of the sculptor, I thought how truly, also, is this a symbol of educational institutions. The guardian spirit is the faculty, and the urn the receptacle of God's mysteries; but in this the spirit must lift the lid and invite the inquirer to view the beauties within.

### *Discussion.*

Dr. A. W. HAIDLE, Detroit, Mich. The four requisites in development, as Dr. Ault has given them, are to be, specific scientific instruction, specific manual instruction, specific soul instruction, and some provision for a uniform entrance examination and a uniform graduation examination for dental students. As I am more deeply interested in the subjects of scientific and manual instruction than in the other two requisites, I will confine my remarks to them.

In the scientific department there are four objective points to be attained, namely, a knowledge of physiology, pathology, surgery, and dental medicine. I do not believe that either one of these should be the first subject taught in the school. Before the mysteries of physiology are opened to the student, he should have a thorough knowledge, first, of osteology, then anatomy and histology. Before he studies pathology he should have, also, a thorough knowledge of these same subjects. The same may be said of surgery.

In regard to dental medicine, the student should first have a thorough knowledge of physiology, chemistry, and physiological chemistry. With these four objective points before us, it seems to me this would be a good outline for scientific study.

In the teaching of physiology, shall we teach special physiology? It may be that I do not understand fully Dr. Ault's method of teaching physiology, but I believe he favors the teaching of special physiology,—that is, to have simply the physiology of the teeth, or to make the physiology of the teeth the central point from which to give instruction. Are dental students and practitioners to have no knowledge of general physiology? Are we to know nothing of digestion, the circulation of the blood, and of the central nervous system? It seems to me that the efforts of our teachers in the colleges should be directed more to a general knowledge of physiology first, and then toward special physiology, if necessary.

In regard to the scientific manual instruction, I believe Dr. Ault advances the idea that the freshman student in our colleges should be taken into the clinical department and should there be taught to operate on the live tissues, as his first work. The average freshman knows but little about dental anatomy, and to put him at work upon living, sensitive tissue is a mistake. He should first be put through a thorough course of technical instruction in both prosthetic and operative dentistry.

Dr. AULT. With reference to the comment on physiology being a special study,—that is, making everything point to the teeth,—that has been the course I have pursued for several years, and I find I can always get much more interest by making the subject point in the direction in which the student feels that he is specially concerned. Of course I do not neglect general physiology. I bring that up as a comparative matter, making it incidental or supplementary to the prime teaching of the dental college.

As to the question of manual training in the dental college, we sometimes get an idea, and without any special reflection conclude that is the thing to do. I was much inclined to the idea, at first, that the student ought to have a great deal of work in preparing cavities in the *dead* and *disassociated* teeth, thereby training his hand in the use of instruments and in the introduction of filling-material. Now, I would not want to say that there is not anything in this. It would be a very poor plan indeed if there was nothing in it, but I think that there is not much in it, especially when we say that shall be the plan during all the freshman year and up to the middle of the junior year, and that *then* the student shall start in upon *actual* work. I think reflection is all that is needed to convince us that there is a better plan. I am fully satisfied that the way to learn to fill a tooth is to begin on living teeth as soon as possible; but I make provision for careful oversight. I do not put the student into the clinical department to take care of himself. I should not place over him some student who has nothing to exhibit. My idea is to provide for careful demonstration, and to place the student at work in the beginning. Then by the middle of the junior year you will have an ample corps of demonstrators, at the very time that, according to the other plan, you would expect the student to begin actual work.

Dr. HENRY BARNES, Cleveland. In the main I think we can all agree with this excellent paper. It looks toward higher education.

One exception which I take is to that part referring to technical training. The public schools of the land are beginning to understand the value of manual training. The mind and hand should work together to attain the best results. The student is the raw material, and to place him at work upon the living tissue immediately on entering college requires a larger corps of competent instructors than any institution at present has or can afford to maintain. In order that the student may be thoroughly instructed, he must begin upon the tissues without the mouth. For instance, the filling of a root-canal, apparently a very simple matter, puzzles many an old practitioner. How many of us can say we fill every root-canal perfectly? Now, before the student can fill this canal, he must learn the length of it and the method of filling. The best instruction is with the tooth imbedded in a plaster cast. When he has learned this and other things, he is competent to begin work upon the living tissue.

I believe in a longer college term, but under present conditions the disposition of time and work seems best.

Dr. H. J. McKELLOPS, St. Louis. I have listened with a great deal of attention to this paper, and I am much pleased with it. If the colleges could carry out the ideas therein suggested, every college would be a success. But they do not do so. As far as I have been able to see and learn, by going into our colleges and looking at what they are doing, it seems to me that they are not doing what they should to instruct young men. Look at those young men when they come out! Put them into the operating-room and what can they do? They can perhaps fill a tooth with amalgam, but when they are shown how to do a scientific piece of operative work they say, "I don't care, I can do the other and I can make money at it." A proper foundation should be laid for their professional life-work, and when you lay that foundation of the student in the operating-room, you want a man there who can show him how to prepare a cavity, and how to fill it after preparing it. The success which the student can attain in treating and saving teeth is his bread and butter in after-life; and to meet with reasonable success, he must have his professional education begun at the foundation and carefully built up.

Dr. H. A. SMITH, Cincinnati. I think the time has come in this meeting when some defence should be made of the dental colleges of the present day, and of their methods. I was not in when Dr. Ault began the reading of his paper; but I came in when he was describing a college of the very worst type. I do not know where he graduated, but he has described a college of a quarter of a century ago. There is not a college of that kind that I know of to-day, certainly not among the list of reputable colleges. We find ourselves in a strange, contradictory state in discussing this question. We have a class of men in the profession who claim that no student should be admitted to practice without a literary degree. Men with literary degrees do not come to us with their fingers trained. They have spent their years in acquiring an education ; hence they must receive some preliminary manual training before they begin to work on tissues of the mouth. Their fingers cannot well be trained upon the living tissue of the patient. It would be unjust to the patient ; it would be inhuman. Therefore a system of technics has been devised. It is on trial, and as far as I have observed, it is the only proper method of training the freshman student in manipulation.

Dr. GALLIE, Chicago. I can cite several instances where young men just graduated have been offered places as demonstrators in some of the best dental colleges in the United States. I have in mind an institution where the work of the dental students in the dissecting-room was far superior to that of the students in the medical college. That was the statement of the demonstrator, who is also the demonstrator in the largest medical college in the United States. That does not look as though the dental student was a sloppy workman, or as though he was passed and shoved through the institution simply for the fee.

Now, I can show Dr. McKellops the good results attained in some of our colleges by technical instruction. The young man who comes from the blacksmith shop, or from the mercantile counter, or the other walks of life, does not know a root-canal from the crown of a tooth. To talk of having that man stand over a patient with a broach or a dental engine is nonsense. He would drill holes into the process, and not know where to find the dental canal. I believe it is the proper thing for the students in dental colleges to have a year or a year and a half of instruction in technical work.

There is work done by some dental students that would be a credit to almost any operator in the United States. That fact, and the fact I mentioned in the beginning, shows that the dental graduates from our best colleges are not incompetent, but that they are worthy of the confidence of the profession. I do not believe in hitting at the young dental graduate every chance you get ; it is wrong. The standing of the profession to-day is proof that the colleges are doing good work, and putting into the profession men who are worthy to enter it.

Dr. W. C. BARRETT, Buffalo. If we are to have any profession at all, it must be based upon the education of the student. It must rest with the colleges which are the educators, and the colleges must be sustained. Now, it is a most incomprehensible thing to me that all the incompetent men, who know nothing about teaching, get into the colleges, and that the only wise men are those who never saw the inside of a college, and who probably hold only honorary degrees. How on earth is it that all the confounded fools get into the colleges as teachers while all the bright men stay outside? How is it that the teachers I see before me, Taft and Brophy and Smith, and others, have not learned anything in their twenty, thirty, forty years of study and experience, but remain to-day utter ignoramuses in teaching knowledge? Now, here is Dr. McKellops, the only erudite man among us, the only thoroughly educated man we have in the profession, the only man who knows the principles upon which a college should be founded. In God's name, why is he not in a college, teaching some of our teachers what they ought to know? He is trying to do it in our dental associations, but he is trying to do it with a club; and if I were not a teacher myself and therefore entirely ignorant of teaching, I should say that this is not a good way to impart instruction.

Dr. G. H. **Wilson**, Cleveland. While I agree with the paper in many respects, especially in what it says about higher education and the propriety of having the examination outside of the college faculty, yet I am not at all in sympathy with the idea of ignoring practical or manual training. If there is any one thing our profession must have, it is the ability to do. That we get in the manual training. Manual training is not simply education of the hand, but it is education *by* the hand. We have in times past depended upon the eye and the ear to educate the brain. Now we add the hand, as a new means, a new avenue to the brain. And if we keep the others, it seems to me that with all these means we attain a broader and more complete education. That is what we are trying to do with dental technics. So, for that reason, I am in favor of manual training. Of course, the scientific should never be neglected. If you will take the examinations for entrance, and for graduation, out of the colleges, I think every dental professor will say amen.

Dr. T. W. **Brophy**, Chicago. I am pleased that, through the remarks of Dr. McKellops, this discussion has been continued. It has brought out expressions that should be made in this assemblage. I am sometimes amazed to hear papers and remarks, in meetings of this kind, about the "most unfortunate condition of the dental institutions of our land." What are we now, and what were we fifty years ago? There are men in this room who have lived long enough to see dentistry from its very outset, to watch its growth from the beginning up to the present. They can tell you what it was fifty years ago, and what it is to-day. Compare it with the schools of law and of medicine, and you find that the dental college stands pre-eminent among the institutions of learning of our country. We stand to-day upon a more solid foundation, largely due to the co-operation of dental college faculties, which makes the work and requirements more uniform than in other professional institutions. Ten or fifteen years ago, any one with five years' experience might go to some of our colleges, and after one course of four months take an examination and receive the degree of D.D.S What is the requirement to-day? The course has been extended to three years of not less than seven months, and I predict that within a period of four years we shall have a course of four years of not less than seven months. In view of these facts, gentlemen stand up here and say that our institutions of learning are not doing the work that they should do. How can they do that? We are advancing faster than the other professional schools, and I am very proud of that fact.

I am glad to see this meeting take a deep interest in the subject of the progress of dentistry. I think the key-note of success in dental education is that the students who wish to enter our schools shall be examined by a board of disinterested persons, who will test their qualifications for admission, who will determine whether they possess the requisite knowledge to become students in professional schools, and to become proper persons to enter a learned profession.

The dental colleges of the United States are in earnest. The teachers in those colleges are honest men, who are doing their utmost to advance the standard of the profession. Many of us who are here will soon pass away, and upon whom will rest the best interests of the profession? Upon the young men who are graduating; and I do not like to hear it said that these young men are sliding through in a manner that will not reflect credit upon the institutions and upon the profession; or that they will impose upon a confiding public by putting in amalgam. I am satisfied that the young men who are entering the profession through our schools will reflect honor upon it, and upon the schools themselves, as they are conducted to-day.

Dr. AULT. I wish to say in answer to a gentleman who spoke a few moments ago, that it takes no more demonstrators to begin with the class at the beginning of the term than it does to begin at the middle of the junior year. And the plan which I tried to set forth was, that the chief knowledge to be gained in working on a tooth imbedded in plaster was to become acquainted with its histology and its anatomy, and that there were so many *varying conditions* in filling a tooth, which the pupil would have to become acquainted with ultimately, that it seemed to me the best time to begin was at the beginning, because he *never will* meet with those varying conditions in *dead* and *disassociated* teeth. And I believe if colleges would furnish a sufficient number of demonstrators so that students could begin this work at the very start, it would not be long before they would be self-sustaining, as to demonstrations, and they would have a class of excellent student demonstrators on hand, just as the result of taking care of the beginners at the very commencement of their college life.

Now, as to Dr. Smith's remarks, I did not graduate very long ago, and I graduated in operative dentistry under a gentleman from the Ohio Dental College, and my comments are based on observations during the last ten years. I oppose the taking of students to the middle of the junior year before putting them into actual practice. That is the reason for the clamor for four years instead of three. If you would begin with these students in the right way, right at the beginning, you would not need to take their time for four years. It is a great injustice to ask the better class of students to appropriate four years in learning dentistry as long as we have to uphold the nonsense of working at a bench for one or one and a half years.

Certain classes of applicants for admission should be eliminated. I referred to placing restrictions on the manner of admission. Of course, the paper did not mean to reflect on the very able work that a great many of our graduates are able to do. It was to reach those students who are not worthy of graduation, or of admission. I recognize much that is good in our present system, and am in favor of holding on to all that is good; and there is more that is needed, and that is to quit selling admission tickets to all who can raise one hundred dollars, to give the students the best attention from the first day, and to positively refuse to graduate any but those who merit it. We want a central national authority around which our work can play, so that there shall not be as many standards and systems as there are states and colleges. There are too many standards. We are hearing nearly every year of the establishment of some new college ; and I wish to ask you all, college men, and those who are practicing in the private walks of life, whether there is any reason for the establishment of another dental college under the present mode of procedure, under the present management, as regards admission, time devoted by the student, personal application by the faculty, and indiscriminate awarding of diplomas? The next college that is organized should take a higher plane.

The remainder of the session was devoted to the discussion of papers read by Dr. C. B. BLACKMARR, D.D.S., Jackson, Mich., on "Business Education for Professional Men"; by Dr. GEORGE EDWIN HUNT, M.D., D.D.S., Indianapolis, Ind., on "The Pathology of Inflammation," and by Dr. J. L. CASSIDY, A.M., M.D., D.D.S., Covington, Ky., on "Some Incompatibilities;" after which there was an excursion to Star Island in Lake St. Clair, where a banquet was served, which was participated in by a large number of those in attendance.

## PENNSYLVANIA STATE DENTAL SOCIETY.

(Continued from page 959.)

### EVENING SESSION, JULY 10.

DR. M. H. CRYER gave a lecture upon the "Studies of the Maxillary Bones," illustrated by lantern slides showing the results arrived at by sectionizing the bones in several planes, by which a number of novel anatomical features were brought out.

The principal points referred to were—The relations of the mouth and teeth to and with the maxillary sinus, from fetal life to old age ; the shape and size of the sinus at various stages of development ; the relations of nerves and vessels passing through and along its walls ; the opening of the sinus into the nasal chamber, and the lateral surfaces of the nasal cavities, showing the complex structures that are associated with the nasal portion of the superior maxilla. In the lower jaw the studies consisted of the cancellated portion ; the inferior dental canal, or the cribriform tube of the inferior maxilla ; the relation of the roots of the teeth to the canal and the surrounding tissue ; the teeth in their normal and abnormal positions in either jaw, and changes in the cancellated tissue caused by inflammation.

Following Dr. Cryer, Dr. I. N. BROOMELL gave a lantern exhibit of unusually fine photographs, which he had made of dental subjects, concerning which he said,—

A few months ago, in conversation with a publisher of medical and dental works, the subject of illustrations was spoken of. I raised the point that the illustrations in the dental text-books, as well as those in dental literature in general, were not what they might be ; in fact, not what they should be. The half-tone process work of the present day being so far in advance of the old wood engraving methods, both in artistic beauty and truthfulness of representation, calls for its adoption. It was argued, on the other hand, that the work of the wood engraver is, and always will remain, pre-eminent. From an artistic point of view this is no doubt true, for all works of art, to be accepted as such, must have been produced by hand. The instant that any mechanical device is brought into use in creating the work, that instant its value is diminished.

The illustrations in the text-books for the student, or in the journals for the practitioner, are placed there for what purpose? Not to make it a picture-book for the entertainment of the general reader; not to consume space that might better be utilized by well-written text, but for the special intention of imparting to the reader knowledge which it would be impossible for him to obtain from the text alone.

Then, if that be the purpose, if it be knowledge and not art that we are after, why not adopt that method most true to life? I am aware of the attempts that have been made to introduce process cuts by one or two dental journals. I am also aware of the severe criticism which these cuts have received. But with all the imperfections, the effort deserves encouragement. Every advance step must have a beginning; perfection is the last thing to appear. There is an old saying, "A little knowledge is a dangerous thing," and this is nowhere more applicable than in the meager information received from a poor illustration.

The publisher in question appeared to be of the opinion that the subjects for dental illustration were not generally of such a class that they could readily be produced by the photogravure methods. Very true, a few of them are not; but it was partly with the idea of ascertaining what could be accomplished that I began experimenting with the camera, and the results of my experiments I will show you tonight.

A paper by W. E. Christensen, D.D.S., of Munich, Germany, was read by Dr. Huey, in the absence of the essayist, as follows:

## On Porcelain-Inlay Work.

Mr. President and Gentlemen: I want to state that this paper has been prepared by special request. When I was first invited to prepare a paper for this meeting, I intended to write on a different subject. Porcelain-inlay work, though not a new thing by any means, seems to have aroused new interest among progressive dentists, since of late years many improvements, both in the material and in the instruments used for making it, have come into the market. I am aware, however, that while the number of dentists practicing it is steadily increasing, there are still a great many opponents to this kind of work. I am glad of this opposition, for nothing is more dangerous to the best interests of dentistry than a too sudden acceptance of new methods, and their introduction into daily practice, before they have been thoroughly tested by special experiments. Even the best and most skillful practitioners ought to devote a great deal of study to such methods before applying them in their general practice. The experience taught us by the abuse of bridge- and crown-work may serve as a warning.

Porcelain-inlay work, as I said before, is far from being a new thing; and yet, because of the new process of making it, it can almost be considered a new kind of work. The old, tedious method of grinding a piece of porcelain so as to fit roughly into a cavity in a very conspicuous tooth, is well enough known to most dentists. The work took a great deal of time, and the results were usually far from satisfactory. There are cases, however, where even the best dentists would prefer such an inlay, imperfect as it may be, to the very best gold filling. Such cavities are those on the labial surface of the front teeth ; while, on the other hand, cavities which are still more conspicuous—as, for instance, large contours in the incisors and cuspids—could not be restored at all with porcelain. The new method consists simply in taking an impression of the cavity with platinum foil, pressing the foil into the cavity with balls of cotton, and burnishing it smoothly over the edges. By this method a matrix is made and at the same time an impression of the cavity is taken, and the inlay can be built and baked in this matrix so as to fit the cavity. In this way we obtain well-fitting inlays, and large sections, contours, and even projecting corners of the incisors can be restored a great deal stronger and a great deal better looking ; and the operation can be performed with a great deal less trouble to the patient than would be possible with gold or any other material.

The chief objection to all kinds of inlay work is the belief that the cement with which it is set will wash out and leave an empty joint. This danger certainly exists, but, though not entirely obviated, it is reduced almost to a minimum by the high degree of fit and contact which can be obtained by fusing or "casting" the inlay for each special cavity. The heaviest foil used is No. 60 ; skillful operators will soon be able to use much thinner foil, but even with No. 60 the inlay can be made so as to leave no joint at all. This is done simply by slightly beveling the walls of the cavity outward from the margin, so that when the platinum is removed the inlay will fit tightly on the beveled edges of the margin, thus taking up the space occupied by the platinum and making a perfect fit at the margin. To accomplish this the inlay need not rest on the bottom of the cavity, but should only extend sufficiently into the cavity to be retained. When I make inlays in the molars, which I do only for very large cavities,—believing that in this way I obtain the nicest and strongest fillings with the least trouble to the patient,—I use very heavy foil for the matrix,—say No. 60,—and after removing the foil I set the inlay with cement, cleaning out the joint, however, with a pointed excavator before the cement is quite hard ; or I let it get hard and then clean it out with a very fine bur, and fill it up with amalgam, which entirely prevents any washing out of the cement.

The methods of retaining the inlays are several. When only one wall has been destroyed, as in labial cavities, the inlay, of course, cannot be made to extend into an undercut. Undercuts may be made, but only after the impression has been taken, and merely enough to hold the cement. The inlay, however, can be made with a retaining-groove in the inlay itself, by placing a ball of hardened plaster of Paris on the bottom of the matrix before introducing the body, and scraping the plaster out again after the baking. In this way the cavity holds the cement, and the cement holds the inlay (Fig. 1). If the case is that of a corner contour, the inlay can be made to extend into one undercut, which must be made as wide and deep as possible, into the cervical portion of the tooth (Fig. 2), provided the tooth is not a dead one, in which case, of course, the inlay can be made to extend into the pulp-chamber. Inlays in the large molar cavities are usually sufficiently retained by merely extending into the cavity. The retaining groove may be made in the inlay itself, or, if the tooth is a dead one, a pin from a porcelain tooth can be baked into the porcelain so as to extend into the pulp-chamber. (Fig. 3.)

The baking of the inlay is a simple process. The porcelain is obtained in the form of a fine powder, like the body for continuous-gum work. I use exclusively the Downie bodies; they come in twenty-four different shades, so that there is no trouble in matching any tooth. The treatment of the powder is similar to that used in continuous-gum work; it is mixed with distilled water to a cream-like consistence, and applied with fine camel's-hair brushes. For its first introduction into the matrix I use a fine-pointed steel instrument, so as to make sure of getting it into every corner, also because in this way it is easier to reach the bottom of the matrix without touching the edges. At the first and second baking the edge must be left free on account of the contraction of the body, and for this same reason the body in the matrix should have a convex surface, as otherwise it is apt to contract the matrix and change its shape. At the last baking, only, the body should touch the edges of the matrix. In the handy Downie crown furnace the body can be fused in from one and a half to two minutes, so that even a number of bakings will not take much time. The edges of the matrix serve as a guide for the correct shape of the inlay, and when a large section is to be made the correct size and shape are produced by repeated bakings, and by gradually adding body until the desired contour has been obtained. In making the matrix, a piece of foil must be used sufficiently large to be folded into a triangular shape, or, better, into the shape of a funnel, which is introduced into the cavity with the point toward the deepest portion. The foil, when pressed against the walls with balls of cotton and a pair of stump-tweezers, will spread to the walls without tearing. The burnishing of the edges should be done by hand-pressure only, using a stone burnisher. A piece of India-rubber finally pressed over the entire edge with a uniform pressure will secure a most exact impression. The overlapping foil must not be cut away, but is left on during the process of baking. The matrix may be invested in plaster and silex, or plaster and asbestos; if this is done, it will take one to one and a half minutes longer to fuse the porcelain. I usually get the best results by not investing the matrix, but for the student or inexperienced operator it is safer to use the investment.

FIG. 1.

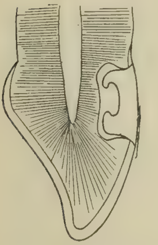


FIG. 2.

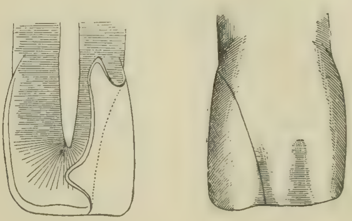
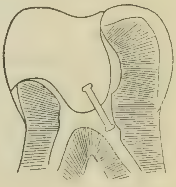


FIG. 3.



### *Discussion.*

Dr. C. J. Essig. I happened to have a case where it was necessary to substitute artificial teeth for four lower central incisors of peculiar shape and color. I found it was impossible to get anything, either of American or foreign make, that approximated the shape and color of the natural teeth. Most of the artificial teeth I could find in this country were flat, while the natural teeth had a particularly broad, brown surface, and it occurred to me to make the shapes of the artificial teeth correspond with the natural ones, but I did not have full confidence that the experiment would prove successful. The glazed surface of the tooth was removed with the corundum wheel; then taking these twenty-four colors referred to in the paper, I selected the color that seemed to correspond with the natural teeth, and built up the surface of the artificial tooth. As I said before, I was not very sanguine that the experiment would prove successful. I first burned one tooth as a trial, and then went on with the other three. The result was perfectly successful.

While the paper was being read, it occurred to my mind that this is a use for the Downie furnace which has not been referred to that I know of. I think it makes the furnace much more valuable.

I made lead-pencil drawings of the tooth, size, shape, etc., and gave them to my assistant to put on the porcelain and burn. It was a very simple matter. Any one who has a good eye and a little experience can follow a lead-pencil drawing of what is wanted, and it can be done in a laboratory without difficulty.

The Downie furnace, as you probably all know, is a little bit of a thing, used with ordinary gas, and it takes only a few minutes to burn a tooth of this kind, and a very short time to cool it. Quite a number of teeth can be done without a great expenditure of time. I really know of nothing more valuable than it is for preparing special forms and sizes of teeth.

By passing the teeth over a corundum wheel, then getting the right color from one of the Downie preparations, then burning it, the teeth had all the appearance of teeth that had been especially made for such a case. I think that the body furnished with the Downie furnace will adhere perfectly and form a very good union between the enamel of the porcelain tooth and itself.

Dr. Guilford. I have no hesitation in expressing the belief that porcelain-work is the coming work. I recognize this just as I long ago recognized that bridge-work had great possibilities, yet at the same time it has its imperfections and limitations at present.

I have had no experience in baking porcelain. I have had very much experience, however, with this so-called glass filling introduced in place of porcelain filling. Part of the process in each case is the same, and a few points in regard to the procedure may not be out of place.

Having prepared a cavity of this kind with parallel or less than parallel walls, a matrix is made of thin platinum or (preferably) a combination of platinum and gold, No. 60, as made by Williams, of New York. Taking a piece of sufficient size to more than cover the cavity, we press it into place by means of a lead-pencil with a rubber point or end, having first given it the same shape as the pencil end that you write with. In that way the foil can be pressed around the cavity nicely and spread over the edges.

Another way is to use cotton instead of the rubber point; but a better plan is to place your foil over the cavity, make a little indentation in it, then take a piece of beeswax or hard wax, and by slightly warming that and pressing down into the cavity it spreads the foil in all directions and fits the cavity perfectly without wrinkles or folds anywhere. When that is removed, it is simply held over a lamp and the wax melted or burned out. The rest of the operation has been described in the paper and by Dr. Essig.

I think this is the coming work because it has so many possibilities. The objection to a porcelain filling is the fact that it is somewhat difficult to build up the filling in one of these matrices so that when the foil is removed it can be placed in the cavity and not be too high or too low. In making a porcelain filling, you have to be skillful enough to get it just right to answer the purpose, and that is difficult; but the chief objection is the perishability of the material with which it is set.

A couple of years ago I had a patient in whose mouth it was desired to have a Logan crown placed. The direction of the root was such that I could not get one that would stand properly. I selected one of proper shade and nearest size, ground off all of the enamel on the buccal surface, and gave the crown the desired form. This left the porous body of the crown exposed, but it was then nicely covered with enamel and baked in the furnace, and came out very satisfactorily. The Downie furnace is probably the smallest gas-furnace that we have, but the Custer electric oven is simpler and more desirable where the electric current can be had. The electric oven is scarcely larger than an ordinary vulcanizing flask, and it is heated by simply turning on a button as you would start an electric light. If there had been an electric current here the appliance would have been exhibited.

Dr. C. V. KRATZER. I have been doing some work in the line of porcelain inlays in the last two years, very much in the manner described by Dr. Christensen. I find that in addition to the method given by Dr. Christensen, the method Dr. Guilford mentioned, that of using the rubber end of the pencil, sharpening it down to a point, is a good one, but I use the writing end without being sharpened. It is of great aid in pressing the platinum foil to the edges of the cavity; but I do not confine myself to these two alone. I use a steel burnisher also. I think I can get a sharper edge by finishing up with this. The foil can be readily burnished down, and will admit of considerable burnishing before it becomes hard enough to leave the edges of the cavity, by its springiness.

This work, I think, is especially useful in incisors and cuspids, where a large gold filling would be unsightly, and for that reason objectionable. I have used it in such cases, and while at first I was skeptical as to the durability of the cement, I found later that my skepticism was entirely unfounded. Of cases put in in that way two years ago, I have seen but a few recently, and there is no perceptible wearing away of the cement. The work is very beautiful when you approach the shade of the natural tooth closely and get a good adaptation; from some little distance it can hardly be noticed at all.

In the other line which Dr. Essig mentioned, and elaborated by Dr. Guilford, that of repairing porcelain teeth, changing the shape, form, and color of the teeth, etc., I find it very useful in my practice. The first use I made of it in that line was in the alteration of a Logan crown. I had occasion to insert a Logan crown, but could find none in my stock to fit the case. The crowns I had were all too small to cover the root. I remedied the difficulty by enlarging the one which came nearest to fitting the case so as to approximate the contour of the root, thus making a perfect fit by slight subsequent grinding.

I have also repaired broken gum-section blocks by slightly beveling the broken edges and filling the grooves with body ; by very careful manipulation the pieces can be thoroughly reunited so that when replaced on the set the joints will be scarcely perceptible, if at all. I have also reattached pins to old blocks by this means.

Subject passed.

(To be continued.)

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## UNION CONVENTION OF THE SIXTH, SEVENTH, AND EIGHTH DISTRICT DENTAL SOCIETIES OF THE STATE OF NEW YORK.

### FIRST DAY—*Morning Session.*

THE twenty-seventh annual convention of the Sixth, Seventh, and Eighth District Dental Societies of the State of New York was held in Bennett Hall, Binghamton, Tuesday, Wednesday, and Thursday, October 29, 30, and 31, 1895. Before adjournment the representatives of the Seventh District Dental Society invited the two other societies to meet with them in Rochester next year, which invitation was formally accepted.

Dr. M. H. FISH, of New Berlin, president of the Sixth District Society, called the convention to order, Tuesday, October 29, at 3 P.M.

Dr. E. D. DOWNS, of Owego, addressed the convention, welcoming the visiting societies, and in the course of his address emphasizing the duties of the officers and members of dental societies in regard to the literary and administrative work necessary for the success of the society in general and annual meetings in particular.

After the reading of the minutes of the last annual meeting and reports of the various committees and acceptance of same, a paper by Dr. M. D. JEWELL, of Richfield Springs, entitled "From the Countryman's Standpoint," was read.

The essayist regarded the superior facilities for culture and advancement which surround the city practitioner as the source of whatever feelings of envy which the country practitioner may have for the former. "It is an undeniable characteristic of the human soul to aspire to something higher than itself; to seek to elevate itself or be elevated into an environment more congenial ; to widen the horizon of its sphere of observation, increase its power of assimilation and the scope of its plane of action. This tendency is equally true of matters pertaining to the material and the spiritual realms."

In the race for knowledge and skill in our now respectable calling, the city colaborer who has the desire to advance, and seeks to improve the opportunities which are constantly about his pathway, moves in a realm of action so far above the average countryman as almost to belong to another order of beings. True, the countryman has opportunities, and, forsooth, improves them ; but it is in the character and magnitude of the city brother's opportunity that the distinguishing difference lies. It is not so much a question of principle as of degree. The citizen enjoys greater freedom and better advantages, and the countryman, though applying himself with all-consuming zeal, falls far short of the ideal simply because the pabulum upon which he must of necessity subsist is so poor in nutriment that he can be but a "lean kine" at best.

The social element in a citizen's life is one of the chief factors in the process of his refinement.

It is only on occasions like that which brings us together to-day that once or twice a year the countryman has the privilege of meeting his fellow-practitioners for a season of social interchange of ideas and general improvement ; whereas the citizen in his dental club and frequent local gatherings keeps the edge of his perception keen and his mind in that active, aggressive state which we countrymen so covet yet fail to emulate.

But there is another phase of the social element that has much to do in promoting or retarding the upbuilding of a professional life, and that is the constant influence of the life and character of our patients, which no one can successfully counteract. In this particular the citizen of any standing enjoys opportunities far superior to those of the average countryman. If there is a class of dentists which more than any other deserves the unqualified commiseration of the profession at large, it is that class of country practitioners who try to live according to the code of ethics and the dictates of an enlightened conscience while fighting the battle of life and striving to steer between the bread-and-butter problem on the one hand and the cast-iron features of the code on the other.

The disreputable element in the dental profession is pretty generally and evenly distributed. Our confiding hope in the direction of the extermination of his cosmopolite Barnacleship is in the antiseptic influence of a higher education, and the gradual and, we trust it will be, uninterrupted elevation of the student's standard of qualification recently inaugurated. The trade instinct is so strongly developed in many individuals as to wholly unfit them for a dignified professional career.

I know of a no more debasing influence, or a practice which tends more to counteract the efforts of the better class, than the advertisements of some in our ranks. The pernicious effect of this custom of using printers' ink is, I believe, more perceptible in the agricultural districts than elsewhere, though I opine the city practitioner is not unmindful of its baneful sway.

I firmly believe until the National Association of Dental Faculties adopt some scheme whereby a graduate shall be bound upon his honor as a gentleman not to resort to such expedients, our efforts to reach the ideal high plane of professional usefulness as professional gentlemen will be well-nigh futile.

### *Discussion.*

Dr. C. S. BUTLER thought that a more distinctly city man should have been called upon to open the discussion than he was, for though he was practicing in a city now, still he was born and grew up in the country, and his first practice had been there, and, truth to tell, he often wished he had remained there. If Dr. Jewell had spent five years in a city office, he doubted whether he would have written the paper as it is. In his estimation the country dentist has many advantages over the average city practitioner, and his life as a whole, with its associations in a country village or small city, compared very favorably with that of his city cousin. The expenses are much less, the display so absolutely needed to build up a city practice not being required.

As to the question of fees and the pleasant introduction of patients, the difference was not so great as would appear to those who knew only one side of the story. We who practice in the city have perhaps had patients who were just as courteous and pleasant when they applied for services as the one described in the paper, but who would, having received the service, declare a perfectly fair charge for the same as outrageous and refuse to pay, and many times you cannot collect.

The only real advantage the city dentist has over the country dentist is in the professional and brotherly association with those who are pursuing the same calling, which is denied the country practitioner except in the annual and semi-annual meetings.

Dr. F. A. GREENE, of Geneva, could hardly tell whether he was a country or a city dentist, but thought that the cause of discontent, when there was discontent, was rather in the man than in the situation. He knew there were hardships in either place, for they had come into his own experience.

The discussion closed, and the convention adjourned to meet at 8 P.M.

In the mean time the business meetings of the different societies were held.

### *Evening Session.*

The convention came to order at 8 P.M., at the call of the president.

Dr. W. C. BARRETT, of Buffalo, entertained the convention and its invited guests, as this meeting had been announced as open to all, with a lecture on bacteriology, illustrated by stereopticon views.

Before showing the slides on the canvas, Dr. Barrett spoke of the vast increase of knowledge made possible by the invention of the telescope and the microscope. Before astronomers had the telescope, the knowledge of the heavenly bodies was exceedingly circumscribed; the heavens showed, as the expression was, innumerable stars and other bodies of which little could be known. With the advent of the telescope the field of observation was enlarged wonderfully, and it was found that the stars which were visible to the unaided eye were comparatively few, and every increase of power of the telescope brings into range of vision more and more till we feel there can be no limit to the number of worlds in the universe.

The discovery of the microscope opened another world, the microcosm, and as the number of stars revealed by the telescope exceeds the number visible to the unaided eye, so the number of organisms brought into our field of vision by the microscope infinitely exceed those within the scope of our natural eyes. The limit of the microscope is the limit of illumination. We could get instruments to show much smaller organisms than it is possible to see now, if we could illuminate them sufficiently.

By the aid of the microscope the whole field of knowledge has, within the past few years, been enormously increased. The world unseen then, now is known to infinitely transcend that which is seen, and organisms too small for human vision, whose existence then was unsuspected, are known to play an infinitely more important part in the processes of nature than do those which are visible, and are more curious in their construction and their function. An important function which they are known to fulfill is the disruption of organized matter, the breaking down of the organism, and the return of its materials to their original elements. Then, too, it has been proven that they are factors in disease. Those terrible pestilences which periodically devastated portions of the earth are now known to have been caused by micro-organisms The terrible cholera now, by cause of this increased knowledge, is as controllable and no more frightful than fever and ague. Just as soon as the disease is understood, it can be controlled. The result of this better knowledge of disease and its causes is that, within a few years, the average length of human life has been increased about five years, and more and more diseases are coming under control. The bacilli of tuberculosis has been recognized, and now physicians know that consumption is communicated from one person to another, and not inherited. The liability to such a disease may be inherited in the shape of a weakened system, but the bacilli cannot be inherited. With this knowledge will come the power to control this terrible disease and give us reason to expect that it can and will be stamped out. Typhoid fever was formerly considered almost necessarily fatal and unavoidable ; now we know its cause, and it is becoming more rare and less fatal every year.

To give an idea of the size of some of the micro-organisms, Dr. Barrett said they would be as much smaller than a man as a man would be smaller than Mont Blanc, yet they multiply so rapidly that it has been computed that the product of one single organism could in four days, if all things were absolutely favorable, increase so as to fill all the seas of the globe. An erroneous idea has existed as to the nature of these organisms. It was thought that they were animals. This is not so : they are as much vegetable as a potato. They grow essentially in the same manner, though they belong to a different order.

As we would not have space in the COSMOS to show the slides exhibited during the lecture, we can only say that though one of the most abstruse subjects that could be placed before an audience composed of both ladies and gentlemen, the lecturer presented it in such a manner as to rivet the attention of all present, and win hearty applause.

### SECOND DAY—*Morning Session.*

The convention was called to order at 9.30 A.M., and on motion of Dr. W. C. BARRETT it was

*Resolved*, That the members of this convention learn with deepest sorrow of the death of Professor James E. Garretson, and they desire to make a formal expression of their admiration for his character and attainments. Whether as surgeon, author, or teacher he came before us and the world, he always gave us reason to feel a just pride that he was one of our profession. At a time that was a crucial period in dentistry, by his erudition, his literary attainments, and his professional fame he aided greatly in elevating dentistry and placing it upon its present high acknowledged plane.

As a teacher, whether with his voice or pen, he stood in the front rank of men, and his efforts to widen the field of dentistry have resulted in great good to all of us and to the world.

Added to all this were the innate qualities of a genial, kind-hearted, lovable personality that made him the idol of his students and the pride of his associates. His death leaves a blank that will long remain unfilled and a void in our hearts that shall never be forgotten, for he was beloved by all of us whether or not we had the honor of his personal acquaintance.

*Resolved*, That in testimony of our sense of the great loss which dentistry has sustained in his death, and of our sense of personal bereavement, the desk of our presiding officer be draped in the emblems of mourning during the remainder of this meeting.

The president's table having been draped in accordance with the above resolution, the following paper by Dr. W. W. FREEMAN was read, in the absence of the author, by Dr. S. A. FREEMAN :

## GOLD VERSUS AMALGAM.

There is perhaps to-day no subject engaging so widely the attention of the dental profession, or one that deserves in so great a degree their profoundest thought and investigation, as that of amalgam. The general use of the plastics by the profession at large is of comparatively recent date, and they have not always been popular. There was a time in the history of amalgam when it was worth a man's reputation to acknowledge its use. Happily, that time is past.

Upon the introduction of the "New Departure," it found some advocates who espoused its cause so warmly that they said "Abolish gold ! use nothing but the plastics." Up to this time gold had held almost undisputed sway as a tooth-preserver, and it was but natural that the conservative dentists who had, through years of successful practice, proved its value should exclaim against such a bold attempt to place a usurper upon the throne so long occupied by the king of metals. Hence they look with great suspicion upon the innovation. Such decided and radical positions were taken by the extreme advocates of each for their preferred material, that gold and amagam were placed in diametric opposition. Long and warm discussions were held. In many cases where the gold men were in the majority, dentists were denied admission to, and even expelled from, dental societies, because they used amalgam. One eminent teacher put himself on record with the remarkable statement that "any cavity that was worth filling at all was worth filling with gold."

The practical conservative dentist of to-day is too busily engaged in the effort to save teeth to refuse to admit into his practice any material that will bring about the result he seeks. He knows from his own experience, as well as from that of others, that gold will not save all teeth ; neither will amalgam restore to health and usefulness all classes of tooth-structure. Hence a careful discrimination in the selection of a filling-material for given cases is absolutely essential.

I doubt much whether those who so strenuously oppose the use of amalgam are in the majority. On the contrary, I venture the opinion that their number is comparatively small. Undoubtedly there are some who maintain an aggressive attitude toward this material, and claim never under any circumstances to use it. A few hold the opinion that operative dentistry has been degraded by the introduction of amalgam. I have no sympathy with these views, opposing, as they do, a material which in the hands of competent and conscientious men has proved its right to existence and recognition as a valuable aid in the preservation of tooth-structure.

In reviewing the literature pertaining to amalgam, and carefully considering the opinions expressed by various writers, I have concluded, and I believe justly, that the use of amalgam has been most severely condemned by those who claim to fill successfully, with gold, all cavities, whether easy of access or in obscure positions, in teeth of frail structure and thin friable walls, or in those presenting the most favorable conditions. To these all-gold operators it matters not that the patient may be possessed of a weak nervous organization, and that a lengthy operation under the all-gold treatment means prolonged suffering from the nervous exhaustion following it. Not only do delicate women and children suffer untold agony from such treatment, but strong men as well have their nerves severely tried.

I do not wish to be understood as condemning gold altogether. On the contrary, I am well aware of its great value, and the impossibility of substituting for it in certain positions any other material. But my plea is for a material which, while insuring the preservation of the tooth, at the same time relieves the patient of the nervous and physical strain incident to prolonged gold operations.

Without doubt more amalgam than gold is used to-day. If all the dental offices in the land could be visited, and an honest enumeration made of the number of fillings put in the mouths of patients, the amalgam fillings would be found to outnumber those of gold. If this be the case, amalgam is a greater factor in the preservation of the teeth than gold. Whether or not these fillings are inserted in a thorough manner is not a question for our consideration at this time. Certainly if one does indifferent or slouchy work with amalgam, his gold work will be even worse. I know that a great deal of bad work is done with amalgam, but this is owing more often to a lack of thorough preparation of the cavity, and bad manipulation of the material, than to amalgam itself. It is time that the too prevalent idea that anything will do for amalgam should be abolished, and that an earnest and conscientious desire to make the best possible use of it should be created.

The chance of failure with amalgam is not yet reduced to a minimum, but the impossibility of imperfection in gold work is greater, I believe, especially with a novice, even under the most favorable circumstances.

Many failures in the use of amalgam are due to causes other than a want of skill and judgment on the part of the operator. There are many things as yet unknown concerning dental amalgams, and the explorer after truth and knowledge will here find a fruitful field for investigation. I am glad to note the fact that prominent scientific men have entered this field, and it is very probable that we shall soon know what metals, and in what proportion, shall constitute an amalgam that will enable us to avoid the "spheroidal tendency" and overcome the "electro-chemical action," and also to produce a filling which shall, under all conditions of the oral secretions, maintain a clean and bright appearance. The average practitioner has neither the time nor the inclination, and perhaps not the talent, to deal with these problems; but at the same time he should assist in every way possible his more scientific brethren.

### *Discussion.*

Dr. A. P. **Burkhart**, of Batavia, said that the paper though brief was worthy, on account of the importance of the subject, of careful thought from those present. There was a time when to be known as a user of amalgam was a bar to the reputation of the dentist, but that time has passed away, and now amalgam is used by every conservative dentist in the country, and this increasing use has been the cause of a better discrimination between amalgams which has encouraged manufacturers to renewed effort for the improvement of this material.

The "New Departure" produced great results. It proved to the satisfaction of many that teeth could be saved with an amalgam filling which could not be saved by gold, and certainly did not, as it was asserted it would, degrade dentistry; but if a dentist uses a poor amalgam because it is cheap, and does cheap, careless work with it, he does what he can to degrade dentistry. Too frequently the amalgam filling is crowded in without properly preparing the cavity, and finished before it hardens. An amalgam filling should receive the same care and attention given to a gold filling; an appointment should always be made for a visit within a few days after the insertion of the filling, so that it may be carefully finished up when it is hard.

The proper selection and combination of the metals in an amalgam alloy will govern the quality of the filling as to good edge-strength and non-shrinkage; there are great differences in these respects, and each dentist should carefully test and observe the condition of every filling that he has put in when he has an opportunity to learn how the particular amalgam used in each case stands the test, and govern himself accordingly. Copper amalgam has been used very extensively, is still used to a considerable extent, though there have been many failures with it. Some of the failures are probably due to faulty manipulation; the trouble often arises from over-heating. The amalgam should be placed in the spoon and held in the flame until the small globules of mercury begin to appear, and then removed from the flame. When care was taken in this regard, it had proved trustworthy in his practice.

Dr. W. C. **Barrett** said that amalgam had its place in dental practice, but we have not fully comprehended its character. Within a short time Dr. G. V. Black has written for the Dental Cosmos a series of articles of wonderful importance to the dental profession. In the study of amalgams he had shown one fact that overthrows one of our pet theories; that is, that amalgam has no spheroidal tendency, but that it has the quality of flowing when exposed to continuous pressure, and that, too, whether the amalgam is new or old, this pressure will cause a change of form or shape in the plug. It crowds out or extends in every possible direction away from the pressure, but is not worn away. In fillings we often find an indentation which continues to deepen as time goes on ; this is from the flow of the amalgam from the pressure of the occluding tooth. In many approximal cases where the pressure is from the adjacent tooth, the flow of the amalgam filling results in such a change of form that eventually the filling loosens and even drops out of the cavity. We have here a new fact which we should study, to see what we can make of it, and how we can improve the methods of placing these fillings so as to neutralize the destructive action of this force.

Dr. G. W. Melotte said the point made in the paper, that one who does indifferent or slouchy work with amalgam would do even worse with gold, was not always true in practice, because a man often does best that which he likes best to do, and if a dentist had learned to like gold filling and took pride in it, he might be led to slight amalgam work as being unworthy of his skill. Beside this, with the love for gold work comes the love for the good prices such work commands ; this is an incentive to care which is influential with most of us. The nervous strain of long-continued operations of gold fillings has, he thought, produced its quota of inmates of early graves and insane asylums. He held in highest honor the men who studied amalgams and had the bravery to lead in the "New Departure," and he felt that now the profession was ready to credit their views. We know now that amalgam does and will save teeth. He had recently removed an amalgam filling which was inserted more than forty years before by Professor Newcomb. Of course, it was one of those made from filings from a silver coin, and it was as black as possible, but those old fillings saved the teeth ; he doubted whether any of the modern amalgams did any better, though the advantage of holding their color is with the amalgams we have to-day.

Dr. W. E. Marshall read the following paper :

## THE FIRST PERMANENT MOLARS.

Mr. President and Gentlemen : If you do not all agree with me in deeming these the most important members of the dental family, you will at least give your consent to the proposition that they claim more of our thought and anxiety than any others. As their importance is so well understood by every reputable practitioner, I feel that it would be out of place for me to enlarge upon that part of our theme before this intelligent assembly. If, however, we can by a free discussion of the subject gain a little more light on one of the most perplexing questions of our every-day practice, or come a little nearer to an agreement as to the best method of preventing what we all deplore, the prevalence of caries in these teeth, or of staying its progress and repairing its effects, I feel that our time will not have been spent unprofitably.

As the greatest requisite in combating and eradicating any disease is a thorough knowledge of the circumstances which produce it or favor its progress, let us first consider some of the causes of this trouble and the best methods of overcoming them. All will agree that neglect, born of ignorance and indifference, is the first and greatest of these causes.

That "knowledge is power" is most forcibly demonstrated here, for how frequently are we hindered in our best endeavors by the ignorance manifested by such expressions as, "I did not know they were permanent teeth," "I never thought it was necessary to fill the temporary teeth," or, "Pull it out and done with ; it doesn't matter much back there anyway." How often are we discouraged by such evident lack of knowledge, and still more by the stolid indifference sometimes evident when we have done our utmost to explain the necessity of preserving both the deciduous and the permanent teeth. But we must continue to explain and to impress these things upon the minds of our patients, and the reward of our honest endeavor will come, probably in greater degree to our successors in the profession than to ourselves, but come it surely will.

When, however, we have in this way done all in our power with individuals, we will have accomplished but little toward the education of the masses. The study of dental physiology and hygiene in our public schools would do much to improve these conditions in future generations, but to reach the people whom we should reach I should be much in favor of some such plan as that outlined in Dr. Warner's paper, published in the Cosmos of January, 1893, in which he advocates the appointment of an educational committee in every dental society, whose duty it should be to prepare for the public press interesting and instructive articles on dental matters, so keeping the subject before the people as, at least, to leave no excuse for the ignorance now so prevalent.

While we give due consideration to physiology and hygiene, we should not neglect diet and exercise as important factors in the development of the teeth, and worthy, I think, of more attention than they receive from either the profession or the laity. The first molars are developed at a period when the demand for bone-producing elements in the system is greater in proportion to the supply than at any other, and unless those elements are forthcoming in sufficient quantity, the teeth are sure to suffer, since nature supplies first those parts which are of more vital necessity, the bones of the skeleton. We as a people are prone to eliminate from our food-products those parts in which are stored, in greatest quantities, the elements fluorin and calcium, so necessary in the formation of good enamel and dentine. Children should be encouraged to eat such food as contains the bone-producing elements in the best proportions and in the best form for ready assimilation, prepared in such a manner as to require thorough mastication.

It is a law of the animal kingdom that an organ unused loses its function and deteriorates or disappears entirely ; so if man should cease to use his teeth, he would soon become edentulous. If the deciduous teeth are made to perform a reasonable amount of work, a demand for tooth-tissue is created, the functions which supply it are stimulated, and much good results to the developing first molars and, indeed, to the whole permanent denture, while the more thorough insalivation and the more perfect digestion and assimilation of the food which result benefit the whole system.

A better appreciation of the value of the first molars and a more thorough understanding of all the circumstances which influence them in their struggle for existence would beget in parents a more intelligent interest in their care and greatly facilitate the preservation of them. Children would be taken to the dentist in good time, and his services could be rendered with much more satisfaction both to himself and to his patients.

A few general rules, together with the operator's enlightened and conscientious judgment, influenced, of course, by the ability and willingness of the parent to pay for the work, must be our guide in deciding when and how we shall endeavor to preserve these important organs. As a rule they should always be retained in position until the eruption of the bicuspids. Then if their structure and their tendency to decay seem to predict their loss within a few years, their removal before the eruption of the second molars is advisable. We so frequently see good results from their extraction before the eruption of the second molars as compared with the disastrous results of their removal after that period, that we deem it a safe rule, where there is not a probability of preserving them permanently, to extract before the twelfth year, while subsequent to that period every effort should be made to preserve even their roots.

Having decided that the teeth should be preserved, the operator must use his own judgment in the adoption of methods and the selection of materials. Gutta-percha and oxyphosphate seem to give the best results where the tooth-structure is poor or the decay extensive, while in other cases gold and amalgam are preferable. Even when badly decayed, with pulp almost exposed, these teeth may still be preserved by thoroughly sterilizing a portion of the decayed dentine to be left for the protection of the pulp, and filling the cavity with gutta-percha or oxyphosphate after coating it with an impenetrable varnish, or placing over the nearly exposed portion a wafer of temporary stopping. Sterilization is best accomplished by thoroughly drying the dentine, and sealing in the cavity, for several days, a good germicide, such as a paste made of zinc oxid, with creasote and oil of cloves placed in a depressed disk of tin and inverted in the cavity. If successful in saving the pulp, we can fill more substantially later on.

The models presented show plainly the evil results of extraction of the first molars after the eruption of the second. These are the models of the denture of a young lady, three of whose first molars, perfectly sound, were extracted when she was thirteen years of age. The reason given for their removal was that otherwise there would be no room for the third molars. In this case only one of the spaces has been filled, while the occlusion on the right side has been ruined. The best masticating surface is the lower left, where the first molar was allowed to remain. True, the third molar has not erupted here, but we do not know that it would have, had the first been extracted, and if it had we have little reason to believe there would have been a good occlusion. The crowding of the anterior teeth has not been remedied by the operation. Here we have permanent spaces created, masticating surface sacrificed, occlusion sadly deranged, and no benefit resulting even to the crowded anterior teeth. Had those teeth been decayed much good would have resulted from the preservation even of the roots of the right lower.

The disaster resulting from the loss of a tooth is not merely in proportion to the amount of masticating surface sacrificed, but depends on the derangement caused in the remaining teeth.

We may classify cases and lay down general rules, but when we come to practice we must deal with individuals and not with groups; we must study and determine the fine variations of each case, and adapt treatment accordingly, and our success will be in proportion to the skill and judgment we exercise in such adaptations.

### *Discussion.*

Dr. A. H. Hofheinz, of Rochester, spoke of the frequent unnecessary extraction of the first permanent molars, and said every possible effort should be made to save them, at least till the eruption of the second molars was complete. Of course, when a patient comes with these teeth hopelessly decayed, they will have to be extracted, but if the child is seen before they are far gone, the dentist should be able to save them. Very rarely should they be extracted to correct irregularity; sometimes, perhaps, it is necessary, but they are the most important of all the dental family, and this truth should be impressed upon all.

Dr. G. W. Melotte said as the teeth, like the hair and nails, were appendages of the skin, the quality of the teeth was affected by diseases of the skin, such as the eruptive diseases of infancy, occurring during their development. They are also affected by diseases of the organs of assimilation. If the child has a dyspeptic stomach, no matter what it eats the stomach will not assimilate the lime-salts, and the teeth will suffer. It is the investment of our gains rather than the amount of them that makes wealth, and it is the assimilation of food that builds up the tissues. Veterinary surgeons say the keep of an animal is recorded upon the horns; a cow raised in the country, taken to the city for a few years, then returned to the more natural life of the country, will have larger growth of horn-tissue while in the country than while in the city; the rings which mark each year's growth will be noticeably larger. It is thus with a child: the tooth-development during sickness will be less perfect than during a period of robust, healthy activity. School children should have their teeth periodically examined, the results tabulated and sent home for the information of their parents.

(To be continued.)

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## AMERICAN DENTAL ASSOCIATION.

(Continued from page 971.)

### Second Day—*Evening Session* (Continued).

Dr. James Truman, Philadelphia, thought the discussion seemed to have lost sight of the idea advanced in the first paper, that the pulp passed on from early life to old age, and that eventually it degenerated and was resorbed. This is an important point if true, but the speaker is not prepared to believe it. The evidence we have had in the past is that there is a gradually increasing density of the teeth up to the time they are lost in old age. If he understands the matter correctly, the recent investigations by Dr. Black have decided the question, which has heretofore been only theoretical, and he should like to hear from Dr. Black on the point. Dr. Truman's own investigations, microscopical and otherwise, have convinced him that there is a gradual increase in density and that at no period is there resorption. Of course, a pathological condition is sometimes apparent where the pulp seems to exhibit a resorptive power and to gradually destroy the dentine, but that is not what Dr. Smith referred to in his paper. It is not scientific to dogmatize on these matters. We want facts, and he believed Dr. Black could give them to us.

Dr. G. V. BLACK, Jacksonville, Ill., would be glad to say a word on the subject. The exact figures can be studied in the DENTAL COSMOS for May last, but it is a pretty long study, and will require some time to work out from the figures a clear view of the subject. It is a fact that the teeth become denser—their specific gravity greater—from youth to old age, though the difference is not great and requires the finest and most sensitive balances to demonstrate. The increase in strength is not very great, nor are the differences between teeth very great, but they are certain. We find an average density in the teeth of a child. Take the teeth of a child before its teens, then in its teens up to twenty years, which is the period of the greatest increase in density. From twenty to thirty the increase is slower; from thirty to forty or forty-five the increase is very slight. Then from forty-five to sixty the increase in density again becomes greater. This is the way this has developed itself in his experimental work. He understands that Mr. Tomes is now repeating this work, and he expects the results of that investigator to practically confirm his own conclusions; not precisely, because no two sets of teeth taken from the mouths of one hundred people will give exactly the same results, and it will require that the experiments be repeated with teeth from as many as one hundred persons to give a really good demonstration. The differences in density of teeth of the same person are almost as great as those of one hundred. There is a wonderful uniformity in the density of the human teeth.

With reference to the pulp, the moment it is dead this increase in density stops. The increase in the density of the teeth after middle age shows plainly that the teeth need nutrition throughout life. In teeth worn down considerably, so that the enamel is worn away from the occlusal surfaces, where there is considerable recession of the pulp, he has found the strength of the dentine impaired, the impairment being in proportion to the recession of the pulp. The very wearing away of the teeth which we have come to regard as normal produces an abnormal condition of the tissues of the dentine; through which the dentine in many cases loses its vitality, fluids are admitted to the dentinal tubes, the tissue becomes impaired, and its strength gradually lost in teeth that are perfectly sound. Wherever a tooth has lost its pulp and begins to show discoloration, the dentine strength is impaired. It may weigh all right, but its strength, tested with the dynamometer, is impaired, and there is a peculiar disposition of the enamel to chip off from the dentine; whereas, in a tooth with a living pulp, this ready parting of the enamel from the dentine is not found. All of which goes to show the value of the pulp, not merely in youth, but throughout life. Its importance may be diminished in later life, but it is still important; and it would seem to him, after going all through this experimental work, that anything we can do to prevent the wearing down of the teeth of patients as they advance in years ought to be done. Often we can build up with the platinum and gold spoken of by Dr. McKellops, and if we are careful to anneal it thoroughly and mallet it strongly, we can make it much harder than hammered cast gold ; stronger than the gold which we put through our rolling-mills ; so that it will bear more stress, and in this way protect the teeth from wear.

One word as to the effects of the exposure of the pulp-chamber to the fluids of the mouth, as in the case of pulpless teeth. If the ingress of the fluids of the mouth is permitted for twenty-four hours, the strength of that tooth is injured for all time. When a pulp must be removed, if the fluids of the mouth are not permitted to enter the chamber, the color of the tooth is retained, if the filling is perfectly done. It is more important that a filling in a pulpless tooth shall be perfectly done than it is in a tooth with a living pulp. The deterioration and weakening of the tooth seem to be, in some way, connected with the admission of the oral fluids to the dentine. The discoloration is dependent on that, and wherever there is discoloration he has found this weakened condition of the tissues. But wherever the tooth is bright, the strength is good. It is a mistake to suppose that bright teeth are weak ; they are the strongest teeth. Wherever there is deterioration in color we find deterioration in strength, and the management of pulpless teeth that retains the color retains the strength.

Dr. TAFT hoped no one would be led astray by Dr. Black's statement as to the retention of the strength of pulpless teeth so long as they retain their color. He does not think that Dr. Black meant that a pulpless tooth, although kept from the injurious effects of the fluids of the mouth and with its color preserved, would have the same strength as before the pulp was lost. Dr. Taft maintains that there is a deterioration in the strength of teeth when their pulps are destroyed, in every case, but it is far more marked in those which become discolored, and this is why he objects to destroying the pulps of teeth.

Dr. BLACK assented to Dr. Taft's suggestion.

Dr. J. T. STEPHAN, Cleveland, O., wished to say a word from the standpoint of the young dentist, with regard to the discussions before the association. For himself, and he believed that he voiced the feeling of the younger men especially who were privileged to be present, he would say that he had been very much interested and instructed by what he had heard at this meeting.

Adjourned till Thursday morning.

## THIRD DAY—*Morning Session.*

The association was called to order at 10 o'clock A.M. ; Vice-President Watkins in the chair.

The secretary read by title a paper by Dr. H. L. Ambler, giving the titles of journal articles appearing during the year on subjects pertaining to operative dentistry.

The committee on the bearing of the condition of the mouth upon obtaining life insurance was announced as follows : Drs. Frank Abbott, Charles S. Stockton, John S. Marshall, Truman W. Brophy, and S. G. Perry.

Dr. CROUSE announced the death of Sir John Tomes.

On motion of Dr. TAFT, time was granted to Dr. Corydon Palmer, of Warren, O., to present some improved appliances.

Dr. PALMER referred to the time of his entrance into the practice of dentistry in 1839, when he helped to bring forward the teachings of our great leader, Chapin A. Harris. During all these years he had been a doer, rather than a speaker or writer. Recently he had devoted much time to the perfection of an angle appliance for the hand-piece, differing from any of those in use in that it is what he calls a quarter angle, which the manufacturers have declared cannot be made. It is strong and large, can be held and used freely, and will take the place to a great extent of the regular hand-piece, as it will be more convenient, and almost the entire excavating can be done with it. Dr. Palmer also presented a card containing six burs of his own design, such as he used every day upon his case, with six of the ordinary burs as we get them, then one which had been reduced to the form which he considered best. The burs bought from the manufacturers are faulty, in that they do not give us the cutting that we desire. Those of his own design, of which there were samples of the round and wheel shapes, cut with a drawing stroke, and are the most useful burs he has. The next instrument shown was a drill to give the final touches to the foramen in the root of a tooth. The ordinary drills for root-canals are so formed that they carry before them the devitalized and putrescent material which the root contains. All drills for this purpose should be used in the fingers, so that your touch will tell you what you are doing. The drill which he showed will bring away the *débris* to the last fragment. They should be made from a steel which has a tough fiber. If we could get piano-wire large enough to hold, it would be preferable to use that.

All of these appliances Dr. Palmer gave freely to the profession through the American Dental Association. In concluding his remarks he said that there was another subject, the placing of arsenic in teeth, which he should probably never bring up before the association again. He had had a hearing upon it at the Columbian Dental Congress, and he wanted to mention it here and thereafter say no more about it. It is not a good thing to place arsenic in the teeth. If you put it in the root of an inferior bicuspid or molar you run a great risk. It is pretty bad in the bicuspids, worse in the first molar, still worse in the second molar, and when you get to the third molar it is really dangerous. It produces irritation all along the side of the face and neck, establishing a soreness there for two or three years. This is a fact. He then showed a specimen of the injurious effects of arsenic, and he asked his hearers, one and all, to stop using the drug. "You cannot," he said, "mix it up in any way in this world but that it is arsenic, and the cloven foot is in it."

The discussion on the papers read at the evening session of the previous day was then resumed.

Dr. D. D. SMITH, Philadelphia, wished to throw some "side-lights" upon the paper he had read, in order that the subject it presented may be discussed fairly and without prejudice. There seemed a disposition on the part of some of the speakers to misunderstand the intent of the paper, which was that a better understanding should be had, not of the destruction but of the usefulness of the pulp.

The first gentleman who discussed the paper had spoken of the intention of nature that the teeth should last to old age. It was certainly not nature's intention that we should see all about us men on crutches or with empty sleeves; but we do see them. It is for us to work out the problem of how to overcome the disabled conditions of the human teeth. The dental pulp of a human tooth is not a holy thing; it is not a thing not to be touched. The teaching of this paper is that whenever the pulp stands in the way of the health of the tooth, we are to destroy it; but it nowhere teaches its wholesale destruction. The thought is rather that we are not to regard the pulp as of so much importance that it is not to be interfered with. In the teaching heretofore there has been no discrimination as to the value of the pulp at different periods of life. The teaching of the paper is that in young life the pulp is of paramount importance, and one object was to draw attention to and correct the impression that we are at all times to consider it of prime importance. There is a time when the pulp is a holy thing, when it must not be touched; that is when it is the builder and protector of the tooth. But there comes a time later in life when it stands in the way of relief to the patient, and then it is ours to destroy it.

In reply to Dr. McKellops, he esteems the matter of the education of the masses of such importance that he believes the best thing we can do is to teach everywhere the need for dental services. He would be glad if the association would discuss the matter, in order that the most practical and useful methods may be adopted for the relief of youthful sufferers. The idea seemed to be given us yesterday that even the dental colleges ought to be suppressed, or that their clinics or infirmaries ought to be suppressed rather than have their work widened. Why, they don't begin to touch the suffering that is endured by the people to-day. Dr. Truman attempted to turn the teaching of the paper into a channel entirely foreign from its purpose, and then declared his disbelief in that interpretation. But because Dr. Truman did not believe his own interpretation, did that change the facts set forth in the paper?

With regard to the remarks of Dr. Black, it is well recognized that he is disinterestedly working for the interest of the dental profession. The speaker had watched him for perhaps twenty years. About that long since Dr. Black gave the profession a paper in which he clearly showed the cause of the differences in the working of cohesive gold, when conditions were apparently the same. That was a hint from Dr. Black of inestimable value, and the man who will keep on throwing out hints of that character year after year is one to be respected, and his opinions are to be regarded. Nothing else in the entire discussion had so pleased the speaker as Dr. Black's remarks. Seemingly in opposition to the position taken by the paper, they actually confirmed it. He stated that the consolidation of the tooth begins in early life and continues up to about fifteen years, when it was less rapid up to a later period, and later still it seemed almost to stop. Was that not what the paper stated? Destroy the pulp at six or eight years of age, and the tooth yields readily to decay. Keep the pulp in good condition until middle life, and the tooth will have been so changed as to have become practically decay-resisting. There was perfect confirmation of the position of the paper, on the part of

Dr. Black, up to the period of old age, and then the paper intimated that there was, in some instances, a withdrawal of the vital forces. The title of the paper was "The Office and Eccentricities of the Dental Pulp," and this feature just referred to was spoken of as one of its eccentricities. The teeth which Dr. Black analyzed may have all been consolidated, and the speaker would not claim that that was not the normal course ; but it is not always so. Some teeth do become softened, not merely at the cervix, but throughout their entire substance, as shown by the dropping out of fillings which have been in position for years, preserving the teeth perfectly till this change in the structures occurs. There certainly has been a change in these teeth, and he claims, as set forth in the paper, that it is due to pulp-action.

Dr. FRANK ABBOTT, New York. From the way the paper read, one would judge that the remarks of Dr. Black in the discussion were in opposition to its argument. The paper stated that there was a change in teeth in old age which apparently indicated a degree of decalcification. Dr. Abbott believes that there is such a change, but he has never attributed it to the action of the pulp. The pulp keeps right on in its work of supplying lime-salts to the dentine as long as it lives, so that eventually the pulp-chamber may be entirely obliterated. But he had never seen this weakening of the dentine, except in teeth where the neck and a considerable portion of the roots were exposed, in which cases there may be an acid present, which slowly dissolves out the lime-salts.

The question of pyorrhea came up in the paper, and it was asked why teeth which do not decay seem to be more subject to this disease than those which are constantly decaying. The speaker has believed that it is because those whose teeth are constantly decaying visit a conscientious dentist, who not only fills the cavities of decay, but removes the deposits of tartar, so that there is little opportunity for a sufficient deposit to produce tartar. On the other hand, many whose teeth do not decay boast that they have never been in a dentist's chair, and the mouths of such people are likely, in time, to get into a condition to cause a great deal of trouble.

With reference to the remarks of the second paper upon materials far capping pulps, Dr. Abbott was always in favor of saving the pulp alive. He considers it not much less than a real crime to wantonly destroy the pulp of a tooth. What we want to get at is the material for capping which will save them. The paper recommends gold for this purpose, placing a thin plate over the pulp and burnishing it into the cavity. What does this do? You know very well that if any space is left between the exposed point of the pulp and the material used for capping, it will invariably fill with serum, even if you use escharotics, and you cannot by any possible means place gold or any other plate of metal without leaving the opportunity for an opening between the point of exposure and the bottom of the cavity.

Dr. PATTERSON denied that he had advocated such practice. What he spoke of in the paper were deep-seated cavities, not exposures or very near exposures.

Dr. ABBOTT expressed his regret that he had misunderstood the paper ; but the point was a good one, and he wished to emphasize it.

A material, to be used successfully for capping exposed pulps, must neither expand nor contract; it must fit perfectly, and irritate the pulp as little as possible. Another point in the treatment of exposures is that the pulp must never be punctured, or it will almost surely die. Gutta-percha has been recommended; but it fails because of its property of expansion under moisture, and almost invariably with him an exposed pulp capped with gutta-percha dies, because, through this expansion, the capping presses more or less upon the organ. He therefore recommends that it never be used for the purpose.

Dr. N. T. Shields, New York. An important point in Dr. Smith's paper, which has not been touched upon in the discussion, is that if the pulp is saved for a number of years, the cavity can then be filled with gold, and, owing to the condition of the pulp and the change in the dentine, you will find around the margins of the cavity a blackness. That blackness, in the speaker's estimation, is due to defective workmanship, and the condition of the dentine has nothing to do with it. As to the compatibility or incompatibility of gold, that really should not be entered into, as gold is one of the most compatible substances with tooth-structure known to the science of dentistry. If gold is properly introduced into a cavity, you will never find a black rim around the filling.

Dr. M. L. Rhein, New York. The point in Dr. Smith's paper with reference to the condition and care of children's teeth merits more than passing attention. If any body of dentists owe a duty to the public at large, it is this association. That portion of the paper struck a responsive chord in me. It ought to be a part of our duty to do something in the way of helping to improve the condition of the teeth of coming generations. One thing to consider is the condition of the children's teeth before they arrive at the age when they are admitted to the public schools. If we as a national organization should send a communication to the various boards of school commissioners throughout the country, informing them of the value of an examination of children's teeth before entering upon their daily studies, one of the greatest benefits to the condition of the teeth of future generations would be achieved. Children are sometimes sent home from school to have their hands and faces washed. How much more need is there that the same stress be placed upon the cleanliness of the teeth. He hoped some action would be taken upon the matter.

With reference to the value of the dental pulp, he agreed with the views that have been expressed as to the advantages of its preservation before the tooth has reached maturity and the tooth-structure has properly consolidated, and with the distinction made by Dr. Smith, that the cases he referred to were not normal physiological but pathological conditions. In these cases, as a rule, there is some nutritional disturbance at the bottom of the pathological condition. That is the basis of all these abnormalities, and the question is whether to let a tooth go on with such an abnormality about its pulp or to remove the pulp. The weight of all the speaker's experience is in favor of its removal as soon as the indications point to an abnormal condition, as he believes that abscesses and troubles of a more serious nature are sometimes due to misguided efforts to preserve the pulp after its usefulness has departed.

The author of the paper, in his reference to pyorrhea, fails to differentiate as to what form of pyorrhea he refers to. Now, there is a very limited class of pyorrhea cases which are due to pulp-troubles, constituting only an infinitesimal portion of the manifestations of this disease. He would also take direct issue with the statement that pyorrhea alveolaris is not found in youthful patients. In a paper read before the First District Dental Society Dr. Kirk reported a case of infantile pyorrhea, and at the same meeting the speaker had himself mentioned the case of a child eighteen months old, which had been referred to him by Dr. McManus. He had noticed pyorrhea in children of all ages, after various diseases, as typhoid fever, scarlatina, diphtheria, and all those diseases which interfere largely with nutrition, and he has come to believe that such diseases may cause it ; not always, but sometimes. Many such cases do not come to the eye of the dentist, because the dental organs at that time of life are in a vigorous state, and the pyorrheal condition is only temporary, the normal condition being restored in a few weeks with any kind of hygienic care. But if the gentlemen of this association will go into the wards of the hospitals, they will find cases of the kind, and he would especially ask their attention to the condition of the gums, more especially of those in the convalescent stages of disease. He lays particular stress on this point, as he did at the meeting last year, because it is time that we should distinguish the form of pyorrhea we are discussing. With reference to the limited class of pyorrhea of which the author of the paper spoke, the speaker agreed with him ; but he wished this discrimination made, because there is only a limited number of cases arising from a pathological condition of the pulp compared with those from other sources.

Dr. JAMES MCMANUS, Hartford, Conn., said that the little patient referred to by Dr. Rhein was the child of a former patient of his, now married to a physician of New York and living in that city. The mother had written, stating that the child needed attention, and asking him to recommend a dentist to whom she could take it ; he had suggested Dr. Rhein, and both father and mother had been pleased with the services rendered by that gentleman.

Dr. A. O. HUNT, Iowa City, Ia., while following the reading of Dr. Smith's paper with considerable interest, had been somewhat confused by its author's use of some of the terms he employed. Thus, he spoke of the rebuilding and recalcification of the dentine and enamel, and the speaker did not understand the use of the terms in this connection. He had also understood the paper to say that pyorrhea does not attack the alveolar wall surrounding the wall of a tooth in which the pulp is destroyed. A few years ago Dr. George W. Miller, of Des Moines, stated in a paper that pulpless teeth were not affected by pyorrhea, and that other teeth in the neighborhood of a pulpless tooth yielded to treatment more readily. He had, since that time, given the subject some attention, but he had been unable to find any perceptible difference in the amenability of such teeth to treatment.

Another point in the paper is the claim that the pulp may become an element of destruction in old age, the evidence for this being that the teeth begin to soften around gold fillings. He thinks this condition can be accounted for from exterior causes. It is a common thing for people past middle life to be afflicted with some form of disease either of vital organs or of some part in close connection with them. His own observation is, that this softening about the margin of the fillings referred to in the paper is due to changed conditions, more favorable to bacteriological development. There are many things to account for this. Almost any of the disturbances of the liver, kidneys, lungs, etc., would cause a change in the secretions of the mouth. One case which occurred to him at the moment was that of a gentleman, fifty-five or sixty years of age, in which this softening around fillings in good teeth was observed. A portion of the decay was removed and sent over to the laboratory for examination. The report from the examiner was that the bacteria of pulmonary phthisis were present in large numbers, for which he was not looking, although he did expect evidence of some constitutional difficulty, as diabetes or Bright's disease. We shall have to change our views as to what causes decay of the teeth, if we are to believe that the pulp becomes a factor in the disintegration. We have abundant proof that it is constantly carrying nutrient material into the tooth, and consolidating it, but no proof that it becomes destructive of tooth-tissue.

A word as to a point in Dr. Patterson's paper, which he had understood to state that a mass of soft or non-cohesive foil could not be welded together. Some years ago Dr. F. H. Gardiner, of Chicago, had occasion to remove a filling inserted by Dr. Allport thirty-five years before, and knowing that Dr. Allport kept a careful record of his operations, he desired to know what kind of gold was used. Dr. Allport reported that it was soft foil. The plug was passed through the rolls and flattened out into a sheet. If there had been no welding of the mass, certainly that could not have been done.

Dr. D. D. SMITH desired to say a word upon the devitalization of the pulp at different periods of life, which had been touched upon by Dr. Abbott, who claimed that there was no difference between different periods of life in respect to this. It seemed to him that there is a great difference. As to pulp-capping, the question is, at what period of life shall we attempt it? The point made by the paper is that after the consolidation of the tooth, or if there is exposure of the pulp, or if the pulp assumes a pathological condition, then when it can be destroyed without ill effects it is better to destroy it. Another point which has not been alluded to is, that it would seem as easy to cap a pulp in a third molar as in an incisor. Who would dare attempt the capping of a pulp in a lower third molar exposed from the distal face? The man who does it takes a risk on his patient's life that the speaker would not dare to take. Who would attempt capping in a lateral incisor or a bicuspid where the cavity is shallow and circumscribed,—classes of teeth in which pulps die on the slightest provocation? It is better in these teeth, after they are consolidated, to destroy the pulp when exposed, because of the almost certainty of unfavorable results which would follow capping. One other point suggested in the paper he should have been glad to have heard discussed by the association,—the prognosis of a set of teeth subjected to natural and healthful mastication as compared to heredity. He believes, as his paper stated, that the use to which the teeth are subjected has more to do with their quality than any inherited conditions.

Dr. PATTERSON, replying to Dr. Hunt, wished to say that dead soft non-cohesive gold is not amenable to welding, whether under the rolls or under the hammer. But soft cohesive foil, which is probably the kind that Dr. Hunt refers to, is entirely different, and, when put through the mill, will cohere. The surface of dead soft foil is so treated that there can be no cohesion.

The discussion was closed.

(To be continued.)

## SOUTHERN DENTAL ASSOCIATION.

THE twenty-seventh annual meeting of the Southern Dental Association was held at Atlanta, Ga., November 5, 6, 7, and 8, 1895. The central position of Atlanta, together with the attractions of the Cotton States and International Exposition now being held there, brought a good attendance to the meeting of the association. There were many interesting papers read and discussed, a full report of which will be given in the DENTAL COSMOS, beginning with the January number.

The election for officers for the next meeting was held Friday, November 8, the following being elected: John S. Thompson, Atlanta, Ga., president; L. P. Dotterer, Charleston, S. C., first vice-president; W. E. Walker, Bay St. Louis, Miss., second vice-president; T. C. West, Natchez, Miss., third vice-president; E. P. Beadles, Danville, Va., corresponding secretary; S. W. Foster, Atlanta, Ga., recording secretary.

The next annual meeting will be held the first Tuesday in November, 1896, at Nashville, Tenn.

# DENTAL SOCIETY ANNOUNCEMENTS.

## PACIFIC COAST DENTAL CONGRESS.

AT a meeting of the general committee of the Pacific Coast Dental Congress, held in San Francisco on October 30, it was resolved "that the congress be held in this city in the month of August, 1897, and that the American and Southern Dental Associations be invited to meet on this coast, in San Francisco, at that time, and hold a joint or separate sessions, as may seem best."

H. T. RICHARDS, D.D.S.,
*Secretary General Committee*,
931 Sutter street, San Francisco, Cal.

## NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

WILL the secretaries, or those who know, and are interested, forward the names and locations of the officers of the state boards of examiners of the states mentioned below? In return, complete printed lists of the boards in the United States and Territories will be mailed, when arranged.

Arkansas, Arizona, Florida, Georgia, Idaho, Illinois, Indiana, Indian Territory, Kentucky, Louisiana, Maryland, Missouri, Montana, Nebraska, Nevada, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Dakota, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, Wyoming.

CHARLES A. MEEKER, D.D.S., *Secretary*,
29 Fulton street, Newark, N. J.

## INTERSTATE DENTAL MEETING.

A MEETING of the General Executive Committee of the Interstate Dental Meeting was held in Kansas City, at which each of the four states (Iowa, Nebraska, Kansas, and Missouri) was represented, and the following action taken:

The place and time of the meeting were fixed at Excelsior Springs, Mo., June 23–26, 1896.

Dr. Henry J. McKellops was chosen supervisor of clinics, to be assisted by Dr. L. R. Fullerton, Iowa; Dr. A. M. Huestis, Nebraska; Dr. C. B. Reed, Kansas; and Dr. H. S. Lowery, Missouri.

Much enthusiasm was reported from all the states, and it is believed this will be one of the greatest dental meetings ever held in the west.

J. P. ROOT, *Chairman*.
S. C. A. RUBEY, *Secretary*, Clinton, Mo.

## ANNIVERSARY MEETING AND BANQUET.

THE following announcement is probably self-explanatory. The invitation is intended to include all reputable members of the dental profession who desire to lend their aid in making the celebration of this interesting anniversary a brilliant success:

PHILADELPHIA, November, 1895.

DEAR DOCTOR,—Fifty years ago the first effort was made to organize the dentists of Philadelphia, by forming a society, having for its object the advancement of dental education.

You are cordially invited to attend a meeting and banquet, to celebrate the Golden Anniversary of that event, to be held at the Continental Hotel, Ninth and Chestnut streets, on Monday, December 16, 1895, at 7.00 P.M. Banquet at 7.30 P.M.

Kindly inform us by December 10 if we may expect the pleasure of your company.

Seats for the banquet will be $4.00 per plate, which amount please send to Dr. J. D. Thomas, 912 Walnut street, Philadelphia, by December 13, in order that a place may be reserved for you.

COMMITTEE.

*Pennsylvania Association of Dental Surgeons.*—Dr. Wm. H. Trueman, Dr. T. F. Chupein, Dr. Howard E. Roberts.

*Odontological Society.*—Dr. L. Ashley Faught, Dr. Alonzo Boice, Dr. I. N. Broomell.

*Academy of Stomatology.*—Dr. James Truman, Dr. R. Huey, Dr. Henry C. Register.

DR. L. ASHLEY FAUGHT,
DR. HOWARD E. ROBERTS,
DR. J. D. THOMAS, Chairman, 912 Walnut st.,
*Special Committee on Invitations.*

# DENTAL LEGISLATION.

## THE NEW JERSEY DENTAL LAW.

"ONLY by experience can perfection be reached."

The above axiom seems to apply to laws as well as to other affairs of life.

The New Jersey dental law at the time of its passage probably called forth more comment than all the enactments of other states put together. By some it was severely criticised ; by others, and by far the larger number, it was most heartily commended and indorsed as a radical measure in the right direction. That the latter were right has been proved without a doubt by the work done under this law and the good accomplished during the five years of its existence.

At the time of the enactment of this law it was found necessary to incorporate in it certain features which were not considered desirable, but it was hoped that time would educate the people up to a standard where the desired changes could be made. This was found to be the case, and in 1894 the clause allowing the extraction of teeth by every one was stricken out.

There have been found two other features in the law which require amendment, and the attention of the governor and the legislature will be called to them this winter, as is shown by a set of resolutions which were adopted by the New Jersey Examining Board at their last meeting. They are as follows :

> "Inasmuch as what is now known as the student's clause of the dental law of 1890 (Sections 5 and 6) has proved to be the cause of much illegal practice and inefficient work, and consequently of great danger to the public and detriment to the profession, be it
>
> "*Resolved*, That the attention of the governor and legislature of the state be called to the matter, with the suggestion that the clauses allowing students to practice in preceptors' offices, and entitling them to an examination after five years' study, be stricken from the law.
>
> "*And be it further Resolved*, That we suggest that the law be so amended that graduates who have complied with the laws of other states having enactments similar to our own, and whose examinations are of an equal standing with the New Jersey Board's, be licensed to practice in this state without an examination, at the discretion of the board.
>
> "*Resolved*, That a copy of the above resolutions be forwarded to the Legislative Committee of the New Jersey State Dental Society."

What is known as the student clause of the law (Sections 5 and 6, Law of 1890) provided for the registering of students in preceptors' offices, and admission to examination after five years' study, allowing the student to practice in the meanwhile, but only under the *direct supervision* of his preceptor.

Experience has shown that this arrangement is most pernicious, as it allows a loophole for the wholesale evasion of the law, more particularly in the so-called associations, where there will be one registered man in charge (not necessarily the owner of the place), and any number of assistants, who are registered as students, supposedly working under him. How much *direct supervision* there is in these cases may be imagined ; and, what is more, these so-called students, in many cases, are not studying with any view of coming before the board, but are being paid as regular assistants, and changing from place to place, thus forfeiting their time (five years' consecutive study under one preceptor is required as a prerequisite to examination) for the sake of increasing their salaries.

It has also been found that it is almost impossible for a student to gain a requisite standard of the advanced education now required in the dental profession without attending college. So that this section of the law has proved to be a failure viewed from every standpoint.

The second suggestion of the Examining Board will, I think, recommend itself to every dentist. In 1894, at a meeting of the Examining Boards of the Eastern Atlantic States, held at Asbury Park, the New Jersey Board recommended that states enacting laws hereafter should make a provision therein allowing examining boards to accept licentiates of other states, when the examinations were of the same standard. Carrying out this idea, the New Jersey legislature will be requested to modify the law of 1890 accordingly. This will, it is thought, strengthen the law and remove the only outside cause of complaint against it; and it certainly is a hardship for a well-qualified practitioner, who has proved his qualifications before a state board, to have to take a new examination whenever he finds it necessary to change his location from one state to another. There is one other feature which it is hoped the Legislative Committee of the New Jersey State Society will not overlook, and this is the subject of preliminary education. That this is an absolute necessity any examining board that requires a written examination can vouch for. The preliminary examinations required by the colleges seem, as a rule, to be a dead letter.

G. CARLETON BROWN,
*Secretary New Jersey Dental Commission.*

# EDITORIAL.

## DENTAL INFIRMARY SERVICE.

AMONG the factors concerned in the scheme of dental education, none has been a more prolific subject of contention than the financial phase of the clinical work performed by students.

Colleges, collectively and individually, have been called to account for reaping a revenue from their clinics, because it is claimed that by furnishing dental services to those able to pay a fair fee they work an injustice to the struggling practitioner, who is entitled to the benefit of the practice of which the college infirmaries deprive him.

At the recent meeting of our National Association, the colleges of this country were openly charged with fraud, in that, while professing to be charitable institutions, rendering practically gratuitous services to the poor, they as a matter of fact conducted their clinics wholly on a revenue basis. The dental profession, as well as its educational institutions, were further arraigned for their lack of altruism in not devoting some portion of their efforts to the care of the teeth of the poor, to which lack was assigned their failure to achieve recognition as a liberal profession. The problem here involved is one which includes a number of important factors, each of which needs to be carefully considered, and all harmoniously worked out, before a settlement satisfactory to all concerned can be evolved. The care of the teeth of the poor is a problem by itself, which *per se* is as closely related to the dental profession as it is to the dental college, and depends for its solution upon the two subsidiary questions,—What ought the profession, and What ought the colleges to do, for the teeth of the poor?

We propose to here limit this discussion to one phase of the subject.

It seems to be assumed by many in the profession that the college clinic is primarily an eleemosynary institution, and any charge made beyond the actual cost of materials used in the performance of operations is unethical; the particular breach of ethics involved being the wrong done to the struggling practitioner by the unfair competition thus brought about.

The view of the function of the college clinic as here noted we believe to be fundamentally wrong. All dental colleges, so far as we are aware, are engaged in the business of educating students in dentistry; and we use the term business in this connection, advisedly. They agree to furnish a definite amount of instruction and training for a certain money consideration; the relation between the institution and the student involves a contract, either expressed or implied, which includes the factors referred to, and thus fulfills in all essentials the definition of a business transaction. The educational function of the college is, therefore, its business, which is conducted solely upon a revenue basis. There never has been and probably never can be any exception to this method of conducting dental educational institutions, until a college is by some means endowed to an extent that will make it independent of the fees derived from students for its maintenance.

A necessary part of the educational equipment of every dental school is its clinical department, where the student is trained in operations upon patients. The clinical department is made a part of the college plant, not for charitable purposes, but as a means of instruction. If it were not needed in the training of students, it would not exist. Hence, its educational feature being its prime motive, whatever of charitable function it may have is a secondary matter, and should be honestly regarded as such. If a college clinic is in any degree a public charity, it is so incidentally, not intrinsically. Hence, the financial question is simply that of the right of an institution to make a charge for services rendered in the course of its dental educational work.

As a matter of absolute right there can be but one final decision,—viz, that the institution has the right to make a charge for its infirmary service, just as it has to make a charge to the student for tuition. As a matter of expediency this view may be, and doubtless is, subject to qualification. There is to be considered, on the one hand, the effect upon many practitioners of the competition which the college infirmary induces, and the demoralizing effect upon a certain class of the public which absolutely free dental clinics impose.

There is no lack of evidence to prove that absolutely free clinics are productive of much harm. The very poor are not the class who in greatest number patronize the dental infirmary, except for relief of pain by extraction of teeth. This has been justly attributed to the fact that the very poor have neither the money to pay the customary slight charge for material used, nor the necessary time to devote to the performance of other operations.

The majority of those who apply for filling-operations or artificial dentures are those who are perfectly able to pay a fair price for the service rendered, while evidence is not lacking to prove that many who seek infirmary service are well able to pay the average rates charged by private practitioners for dental service. To render free service to the class referred to is not only a possible injustice to the graduate in regular practice, but involves a definite moral wrong by encouraging the effort to get something for nothing,—in one word, pauperism.

The competition which the college clinic establishes with respect to the struggling practitioner is perhaps more fancied than real. The graduates of the institution become his competitors as soon as they receive their diplomas, and to prohibit whatever of competition they may engender previous to graduation would be simply postponing the evil day, which of necessity must come later, to be met by the legitimate struggle for existence imposed upon all of us. The struggling practitioner who complains of college clinic competition would probably continue to struggle in the line of resenting all competition, and complain about it under any circumstances. The logical method for the dental college to relieve the practitioner of its competition would be to increase its fees to a point equal with, or greater than, those charged by the latter, or refuse clinical service to any but those unable to pay anything.

Neither method is practicable, for the reason that both would deplete the infirmary of patients, which are a necessity to the dental educational system.

In some instances the compromise measure of exacting a fee only on certain days has been adopted, but the general expediency of such a plan must, of necessity, be determined by the conditions in each case.

The critical attitude of many practitioners toward the details of college methods has, no doubt, its valuable features, in so far as it may tend to bring about improvement, but the expression of such criticism should be tempered with a full appreciation of the importance of the educational institution in the first place, a recognition of its function, and a realization of the factors vital to its educational success. Not the least of these factors is its infirmary, which, for its successful maintenance, is entitled to a proper revenue derived from the service there rendered to a class fully able to pay for it. Finally, the question of revenue from infirmary service would seem to be, under existing circumstances, a question over which neither the dental profession nor any portion of it have the right of jurisdiction, any more than they have over the scale of fees charged by an individual practitioner.

## INFORMATION WANTED.

WE call attention to the request of the secretary of the National Association of Dental Examiners, published at page 1061 of this issue. The work of this body has a direct bearing upon the professional interests of every practicing dentist in this country, as well as of those about to enter the profession.

The work of the association will be greatly facilitated and brought into closer touch with the profession, if the lists asked for are sent in at once. A similar request appeared in our September issue, but it has not met with the response it deserves. We therefore urge upon those in possession of the information in the states named, or elsewhere, to promptly forward a correct statement to Dr. Meeker, as requested, in order that the valuable work of the National Association of Dental Examiners may be as efficiently organized as possible, and its power for good made accessible to the whole profession.

# BIBLIOGRAPHICAL.

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Appendix to Dunglison's Medical Dictionary. Twenty-first edition. Lea Bros. & Co., Publishers, 1895.

Proceedings of the Tri-State Dental Meeting of the State Associations of Indiana, Ohio, and Michigan, held at Detroit, Michigan, June 18, 19, 20, 1895. The S. S. White Dental Mfg. Co., 1895.

# PUBLISHER'S NOTICE.

## CLOSE OF THE VOLUME FOR 1895.

WITH the present issue of the DENTAL COSMOS the volume for 1895 (the thirty-seventh of the series) ends, and with it the subscriptions of a vast majority of its patrons. We trust that the service has been so satisfactory to its subscribers that there will be a practically unanimous renewal for Vol. XXXVIII, which commences with January, 1896.

There will be no falling off in the service of the DENTAL COSMOS. It will continue to print the best products of the thinking minds in dentistry, whether in the solution of the deeper problems underlying practice, or in the suggestion of improved methods or materials for the treatment of oral conditions. It will continue to cover the dentists' world. We believe that the practical dentist can find no better investment for the amount of money involved in a subscription for the DENTAL COSMOS, than in an order for this journal. It is well worth every practitioner's while to know what others are doing along the lines upon which he works, to see the problems which arise as they see them, and to have their light in addition to his own. Approved dental practice is the consensus of many opinions and experiences. The DENTAL COSMOS gives to its readers the "news" of dentistry, not the gossip. Its mission is, not to afford amusement for the loungers round a country store, but to provide a scientific profession with mental pabulum suited to its digestion. It places at the disposal of its readers a wealth of material nowhere else available, and it is well assured that if every practicing dentist were a reader of its pages, the progress of dental practice would be given a tremendous upward impetus.

We therefore ask every old subscriber to renew promptly; every dentist not now a subscriber to become one.

We do not continue subscriptions after expiration, unless definitely ordered so to do.

Those whose subscriptions expire with this issue will find a bill for the next volume inclosed. This is intended as a reminder that it is time to renew. A detachable blank order for the convenience of intending subscribers will be found at the end of the reading matter.

The DENTAL COSMOS does not club with other journals, nor does it recognize subscription agencies. Any of our houses, or any reputable dealer in dentists' supplies, will take subscriptions.

Subscription price, to United States, Canada, and Mexico, $2.50 a year in advance; to other Universal Postal Union countries, $3.00. Half a year, half price. We pay the postage in all cases.

Subscriptions must begin January or July.

THE S. S. WHITE DENTAL MFG. CO.

# OBITUARY.

## DR. JAMES E. GARRETSON.

At a special meeting of the Board of Trustees of the Philadelphia Dental College, held October 28, 1895, the following minute was adopted :

The Philadelphia Dental College has sustained an irreparable loss in the recent death of one of its most distinguished professors, James Edmund Garretson, A.M., M.D., D.D.S. For twenty-one years Dr. Garretson has been connected with this institution as Instructor in Clinical Surgery, and since 1878 as Professor of Anatomy and Surgery, and Surgeon of the Oral Clinic. In these departments, as well as in his office of Dean for the past fifteen years, he has displayed marked ability, and exercised such unerring tact, prudence, and skillful management as not only to gain the confidence and command the esteem of his colleagues, but to contribute largely to the present prosperity and well-merited reputation of the college. In his specialty as oral surgeon he aimed to bring the cognate branches of dentistry and medicine into close affinity, and thus to enlarge and elevate the domain of dental science. In this he was eminently successful. As the founder of the "Garretsonian Society" he drew many to the fascinating pursuit of philosophical literature, which he forcibly and eloquently expounded, while he infused new interest into the study of anatomy and physiology.

In Dr. Garretson's relations with the students, it is no exaggeration to say that he was fairly idolized by his classes, who uniformly found him not only the able and faithful teacher, but the warm personal friend. Ever ready to aid, to counsel, to sympathize with the discouraged scholar, ever prompt to urge on to renewed effort, to commend where praise was due, it is no marvel that he won the affection of all. His bronze bust, already proposed, may stand in the new Dental College as a monument to the famous oral specialist, the eminent surgeon, the wise philosopher, author, and lecturer ; but, better still, his memory will be forever enshrined in the hearts of those who loved the *man* so well.

In his personal and social relations with the members of this board, Dr. Garretson was noted for his genial courtesy, his large-hearted hospitality, his generous deference to the views of others ; in short, for those gracious qualities which characterize the true Christian gentleman.

To the bereaved family of our departed associate and friend we tender our most sincere sympathy; and yet, while we offer our sacred tribute of sorrow, we may be permitted to remind them, as well as ourselves, that we should take comfort in reviewing and remembering the grand life and noble work of him whose memory we are met this day to honor.

Chas. P. Turner, *Secretary.*

# PERISCOPE.

Guaiacol as a Local Anesthetic.—At the session of the Sociétés Savantes, Paris, of July 30, M. Championnière reported some experiments on a new mode of local anesthesia discovered by M. André, a pharmacist in Paris. In a case of a very painful burn, the idea occurred to dress it with a pomade charged with guaiacol, which, like many analogous substances, might have an anesthetic action. After having experienced the remarkable result of his trial, the thought came to him to see if the subcutaneous injection of guaiacol would give him analogous results ; in that trial his success was complete, obtaining, without any danger, a local anesthesia as absolute as with cocain.

M. André first employed a solution of guaiacol in sterilized oil of sweet almonds. Afterward he preferred olive oil, which is purer and easier to sterilize. He uses a syringeful of a solution of guaiacol 1-10 at first, and later 1-20. The syringe thus permits of injecting about ten centigrams of guaiacol or five centigrams with the 1-20 solution.

It was in extraction of teeth that the first experiments were made by M.

de Marion, at Saint Louis, and by M. Ferrier, at Lariboisière. Four injections were made with a syringe about the tooth. The results were those of perfect analgesia; the pain disappeared and the sensation of contact and movement remained. M. Championnière has made trials which have given him the most satisfying results in some minor surgical operations. These were especially in the ablation of wens on the scalp.

The quantity of guaiacol for an injection may be small, ten centigrams sufficing. In order to obtain perfect anesthetic results, it is necessary to wait five or seven minutes after the injection.

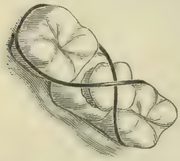
M. Ferrand gave the advice to be very cautious in the endodermic use of guaiacol, for he has seen phenomena of hypothermia and lipothemia more or less profound, and of collapse, which had the appearance of indicating the threatening of grave accidents.—*Medical Century.*

A Case of Complete Separation of the Upper Jaw.—A man aged forty-nine years was admitted to Swansea Hospital on Aug. 7, 1895. He had been struck on the back of the head by a wooden beam and knocked forward on to a coal truck, the sharp edge of which had caught him at the root of the nose. On examination the whole of the upper jaw was found to be detached from the skull, the nasal processes of the superior maxillary bones and the zygomatic processes of the malar bones being fractured. There was over an inch of separation in the middle line. The frontal sinus and anterior ethmoidal cells were opened up. The eyes were quite uninjured. The parts were cleaned and stitched up, free drainage being provided for by the nose. A Smith's gag was used, which kept the parts in very good position. The patient wore this continuously for a fortnight. He is now quite well with the exception of slight ptosis of the right eye.—*Lancet.*

# HINTS, QUERIES, AND COMMENTS.

To the Editor of the Dental Cosmos:

*Sir,*—I read the article on the treatment of alveolar dental hemorrhage by Dr. Otto Arnold in the Cosmos for October, and also the discussion on the use of compresses, tannic and gallic acids. Please allow me to recommend to the profession the use of two-drachm doses of the sulfate of soda or magnesia, every fifteen to thirty minutes, in concentrated solution internally, or from twenty to thirty drops of ac. arom. sulf. in a little water, and iodoform, tannic acid, and tinct. benzoin as a local application, applied on a cotton plug, then slipping a small rubber band over the adjoining teeth, crossing it so. Before applying the rubber band, soften a piece of gutta-percha and form a splint over the cotton plug, the whole being held in place by the rubber band, which also will give an elastic pressure on the part and inconvenience the patient very little.



The soda sulf. I have found to arrest hemorrhage in from fifteen to thirty minutes. I have used it in uterine and nasal hemorrhage, with equally good results.

I respectfully submit these few hints in the hope that they will be of some use to many in the profession. J. S. McDonald, Durango, Mexico.

Not having seen the following recorded, and thinking it may benefit a few in the profession who *do* use arsenic for the devitalization of tooth-pulps, and who may have met with some obstinate cases of odontitis due to its action, and which, although the dressing has been removed, persist in aching, I would state that a ten per cent., or even stronger, solution of cocain will almost invariably arrest the disturbance, and in a remarkably short time. Subsequently the arsenical dressing should be placed in a recess made, far removed from the point of exposure.—Louis C. LeRoy, New York City.

# A MONTHLY BIBLIOGRAPHY OF DENTAL LITERATURE.

COMPILED BY J. MELVIN LAMB, M.D., D.D.S., WASHINGTON, D. C.

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The abbreviations of titles used are those common to bibliographical work, and will, it is presumed, be readily comprehended by any one familiar with dental or scientific publications. Any explanation will be gladly furnished by the compiler. A star (*) indicates a Thesis.

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“ “ No. 548,989, to J. Hood and S. H. Reynolds. Dental engine.
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# ELECTRICAL DENTAL ENGINE OUTFITS.

## The S. S. White Standard Electrical Outfits.

**For the 110-volt direct current, such as the Edison incandescent lighting system, or isolated electric lighting plants in buildings.**
**Can be operated on 220-volt direct current circuits by using the S. S. White special 220-volt Resistance.**

## THE No. 2 MOTOR STAND OUTFIT.

### With S. S. White Dental Motor. With or Without Transformer.

Patented December 6, 1887; August 15, 1893; December 26, 1893. Others pending.

The No. 2 Motor Stand Outfit is designed to advance the application of electricity to the needs of dentists by providing an efficient, compact, and convenient apparatus having a wider range of adaptability than its predecessors.

The apparatus consists of the S. S. White Dental Motor No. 2, an iron stand with a mahogany top, on which it sets, a fire-proof speed-regulating resistance in an iron case supported by the stand, an electro-magnetic clutch on a countershaft supported on front of stand, and a governing treadle connected to it by a cable.

The Motor is inclosed in a glass vase to protect it from dust, and the stand is mounted upon wheels to facilitate its ready movement from one position to another.

The special Motor with this outfit has an extra pair of brushes and collecting rings for use with the Transformer, for operating the New Electric Mallet, Hot-Air Syringe, etc.

When the latter is not used, the extra (outer) brushes should be raised.

On the under side of the Motor are six metal terminals, which (when the Motor is screwed in position) make contact with a similar number of springs on the stand, which are connected to the Rheostat.

This again is connected with the treadle by means of a pair of multiple contact-plates at the end of the treadle-cable, and on the side of the Motor Stand. There is no danger of making the wrong attachment with these contact-plates, as they can be connected in only one position A four-point contact-plate serves to connect the cable from Transformer, or Wall-Switch. Attached to the Rheostat box and adjustable vertically upon it is the countershaft frame, which carries our patented electric clutch and a socket for the standard of the engine, when one is used. Upon the countershaft are mounted two pulleys, the inner one connected by a belt with the motor pulley, and the outer transmitting the power to the pulley of the engine-head. Two sizes of the outer pulley are supplied, by the use of which and the variable resistance controlled by the treadle, various speeds, from about 700 to 5000 revolutions per minute, can be given the engine-bit.

The entire control of the running of the engine with this apparatus is in the treadle. This consists of an iron box with starting, stopping, reversing, and clutch switches inside, controlled by two rocking-pedals upon the top, and with a toe-lever, which curves over the front of the box, and operates the speed-regulating resistance in the stand. At the rear of the box is a large corrugated rubber pad for the heel of the operator's foot.

When the heel of the operator is on the rubber pad of the treadle, the ball of the foot rests on the two rocking-pedals, while the toe-lever is within easy reach of the toe. The rocking-pedal to the left starts or stops the Motor, and governs the clutch. Depressing the inner knob starts the Motor; pushing down the outer stops it. Pressing the outer knob down hard puts on the clutch, and instantly stops the tool. (The pressure should be removed at once on stopping.) The right rocking-pedal controls the direction of the revolutions. With the outer knob pressed down, the tool runs to the left; depressing the inner knob reverses the current, and the tool revolves to the right; that is, if the cord connecting countershaft and engine-head is on properly. The toe-lever which operates the variable resistance governs the speed of the Motor, and consequently of the engine-bit. When at the left the slowest speed is on; pushing toward the right increases the speed.

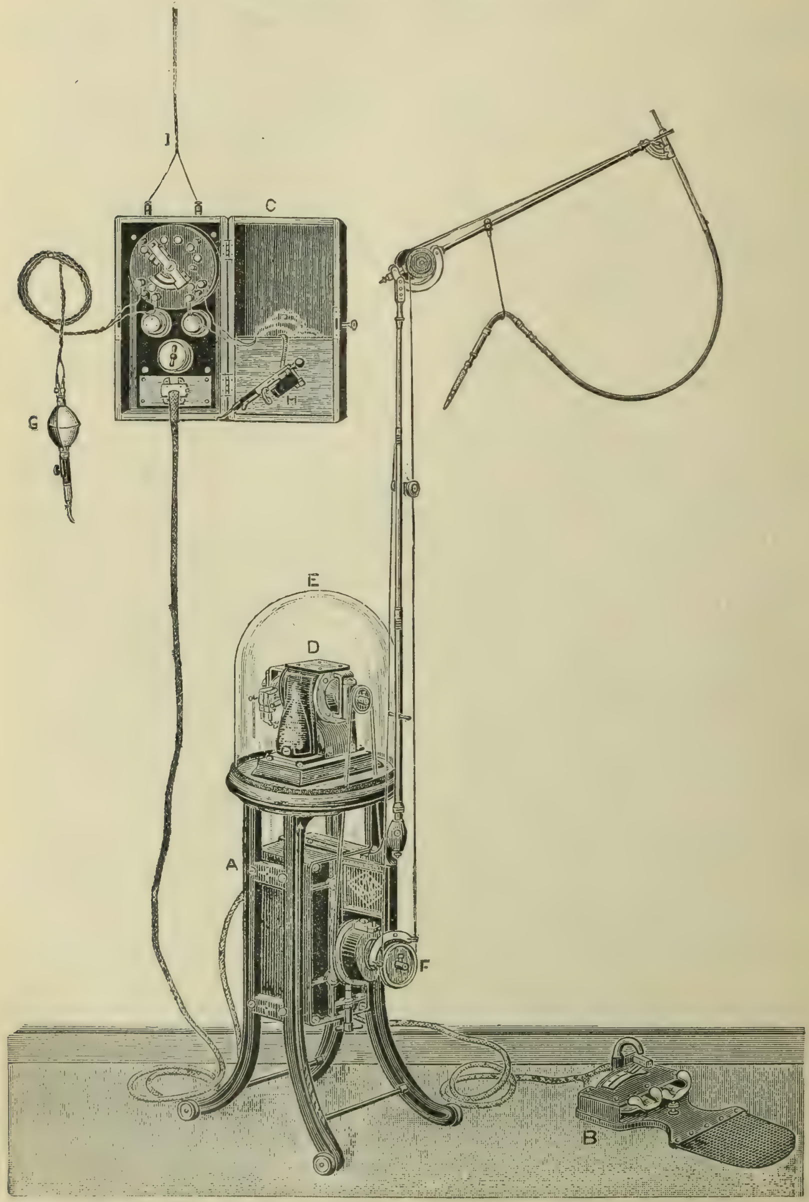
In this very efficient outfit, the only part attached to the wall is the Transformer or Wall-Switch, with the two safety-plugs.

# The S. S. White No. 2 Motor Stand Outfit.

With S. S. White Engine-Head and Flexible Arm attached to Upper Arm and Standard of Cord Engine. With Transformer for Operating Electric Mallet, Mouth-Lamp, Cautery, Hot-Air Syringe, etc.

**For 110-Volt Direct Current Circuits.**

Patented July 6, 1880; December 6, 1887 (Nos. 374,221 and 374,225); January 7, 1890; August 15, 1893; December 26, 1893. Others pending.

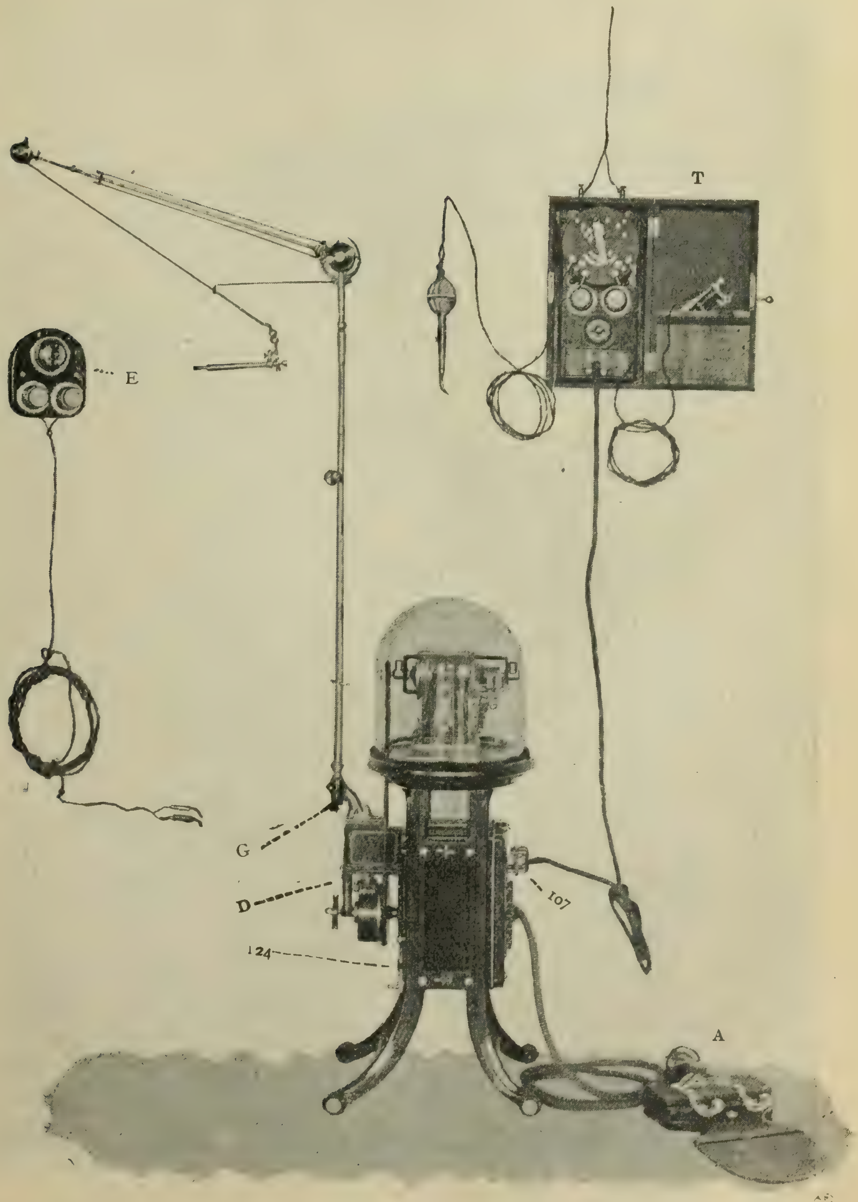


This Outfit can also be furnished with Wall-Switch E in place of Transformer. For prices, see page 5.

# The S. S. White No. 2 Motor Stand Outfit.

## With Transformer, Special Standard, Doriot Arm, and Handpiece A.

Patented December 6, 1887 (Nos. 374,221 and 374,225); August 15, 1893; August 22, 1893; December 26, 1893. In England, February 28, 1894.

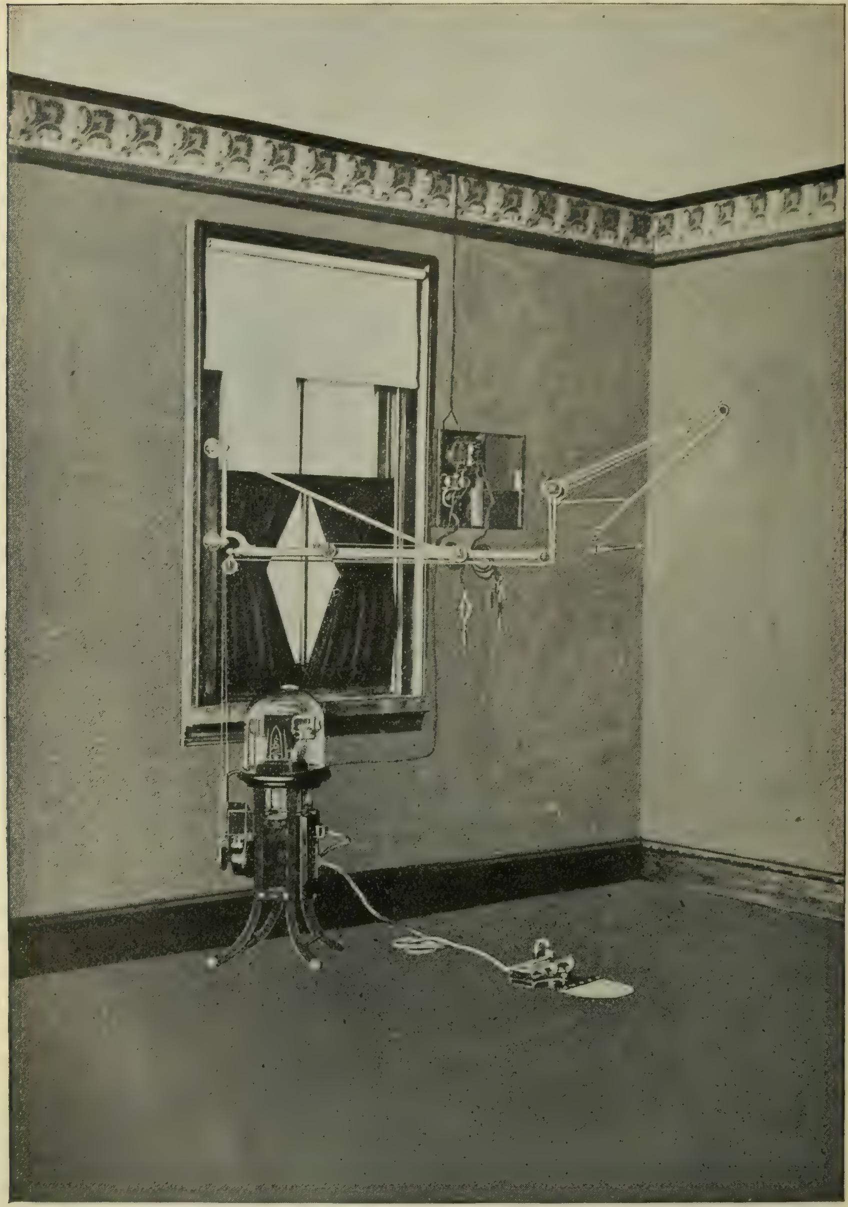


This Outfit can also be furnished with Wall-Switch E in place of Transformer. For prices, see page 5.

# The S. S. White No. 2 Motor Stand Outfit,

With No. 2 Engine Wall-Bracket and Doriot Arm with Hand-Piece A, with Transformer.

Patented Dec. 6, 1887; Aug. 15, 1893; Dec. 26, 1893; Aug. 22, 1893; July 3, 1894. In England Feb. 28, 1894.



(NOTE: The S. S. White Flexible Arm and Hand-Piece, Weber-Perry Cord Engine, or Shaw Engine Arms and Hand-piece can be furnished in place of Doriot Arm.)

This outfit can be furnished with Wall-Switch E in place of Transformer. For prices, see page 5.

**The S. S. White Flexible Arm, as supplied with these outfits, now includes the Duplex Spring and Flexible Arm Support, as advertised in the DENTAL COSMOS for September.**

## PRICES.

**When furnished with Wall-Switch E (page II.)**

| | | |
|---|---|---|
| The S S. White No. 2 Motor, Stand, Starting, Stopping, Reverse, and Speed-Controlling Treadle Outfit alone | $145.00 | |
| The S. S. White Flexible Arm with Duplex Spring and new Arm Support attached to the Weber-Perry Upper Arm and Standard, as shown on page 2, with Wall-Switch in place of Transformer | 44.25 | $189.25 |
| The new Doriot Engine-Arm and Hand-Piece A on Special Standard to fit No. 2 Outfit, as shown on page 3, with Wall-Switch in place of Transformer | $48.00 | |
| S. S. White No. 2 Motor Stand Outfit | 145.00 | $193.00 |
| The Weber-Perry Cord Engine on Standard to fit No 2 Outfit | $43.50 | |
| S. S. White No. 2 Motor Stand Outfit | 145.00 | $188.50 |
| The Shaw Engine-Arm and S. S. White Hand-Piece on Standard to fit No. 2 Outfit | $32.00 | |
| S. S. White No. 2 Motor Stand Outfit | 145.00 | $177.00 |
| The S. S. White No. 2 Engine Wall-Bracket, with Compensating Pulleys, as shown on page 4, with Wall-Switch in place of Transformer | $40.00 | |
| Doriot Engine-Arm and Hand-Piece A | 40.00 | |
| The S. S. White No. 2 Motor Stand Outfit | 145.00 | $225.00 |
| The Improved S. S. White No. 2 Engine Wall-Bracket with Compensating Pulleys, S. S. White Pulley-Head, Arm with Duplex Spring, new Arm Support and Hand-Piece | $65.00 | |
| The S. S. White No. 2 Motor Stand Outfit | 145.00 | $210.00 |
| The S. S White No. 2 Engine Wall-Bracket, without Compensating Pulleys | $35.00 | |
| The Elliott Suspension Engine, for ceiling, with Improved Hand-Piece | $33.00 | |
| The S. S. White No. 2 Motor Stand Outfit | 145.00 | $178.00 |
| Crane, extra | $5.00 | |

**Slip Joint for use with S. S. White Flexible Arm in above outfits, $7.50. The Transformer, with plain front substituted for Wall-Switch E, adds $30.00 to price of each outfit. Glass front Transformer adds $32.00.**

(For description and prices of Transformers, see page 11.)

The No. 2 Motor Stand with 2-inch Rubber tired Wheels in place of the hard wood Wheels adds $5.00.

## UNIVERSAL PULLEYS.

Patented July 11, 1893.

New Patent Universal Pulleys, enabling Motor to be placed in any part of office.

| | |
|---|---|
| Ceiling or Wall Pulley, complete | $3.40 |
| " " " with Universal Joint and Extension Rod | 6.00 |

# THE S. S. WHITE
# NEW TREADLE-RHEOSTAT OUTFIT,

## FOR 110-VOLT DIRECT-CURRENT CIRCUITS.

Can be used on 220-Volt Direct Current with the S. S. White Special Reducing Resistance.

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Patented August 15, 1893, and July 24, 1894.

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To those dentists who have hitherto denied themselves the unquestioned advantages of the electrical current because of the expense of installation, we now have to offer an apparatus which entirely overcomes this objection. The Treadle-Rheostat Outfit will do practically whatever the No. 2 Motor Stand will do, the low price at which the former is sold being made possible by the introduction of a novel method of control. The workmanship is the same that we put into all our products,—the best we know how,—and its parts are simple, so that durability is assured. In practical efficiency there is little to choose between the two, the No. 2 Motor Stand being more highly finished and more ornamental, and comports better with the surroundings of a handsomely furnished office ; but where economy of installation is the first requisite, we can recommend the Treadle-Rheostat Outfit as certain to give entire satisfaction, and it is offered at the lowest possible price consistent with real efficiency and durability.

The novel part of the outfit is the combined Treadle-Rheostat, which consists of a Carpenter Enamel Rheostat and a pedal-controlling switch, both mounted in one case. This case is easily moved on the floor and placed in position convenient to the chair.

The pedal lever swings to right and left of the center. Pushing it to the right, starts the motor forward ; to the left, starts it backward. The farther from the center it is moved in either direction, the greater the speed. Depressing the lever at any speed instantly stops the motor and tool. When the lever is central, the current is cut off.

The Rheostat is fire-proof, and has our patent process of wiring, giving practically full power at slow speed.

The special Dental Motor is spherical in shape, compact, neat, powerful, noiseless, and practically dust-proof.

It has an extra pair of brushes and Collecting Rings to supply current to the Transformer, for operating the New Electric Mallet, Hot-Air Syringe, etc., but can be used without it if desired.

The conducting cable has a new contact plate, insuring proper connection to our motor. The electrical part of this outfit consists of the Treadle-Rheostat with Cable and Contact Plate, the Motor and Connecting Plate, and the Wall-Switch and Transformer and Connecting Cords.

The Motor is either mounted on our new No. 3 Portable Motor Stand, to which any of our foot engine-arms and standards can be attached, or furnished separate to be placed on a shelf and used to drive a suspension or wall-bracket engine.

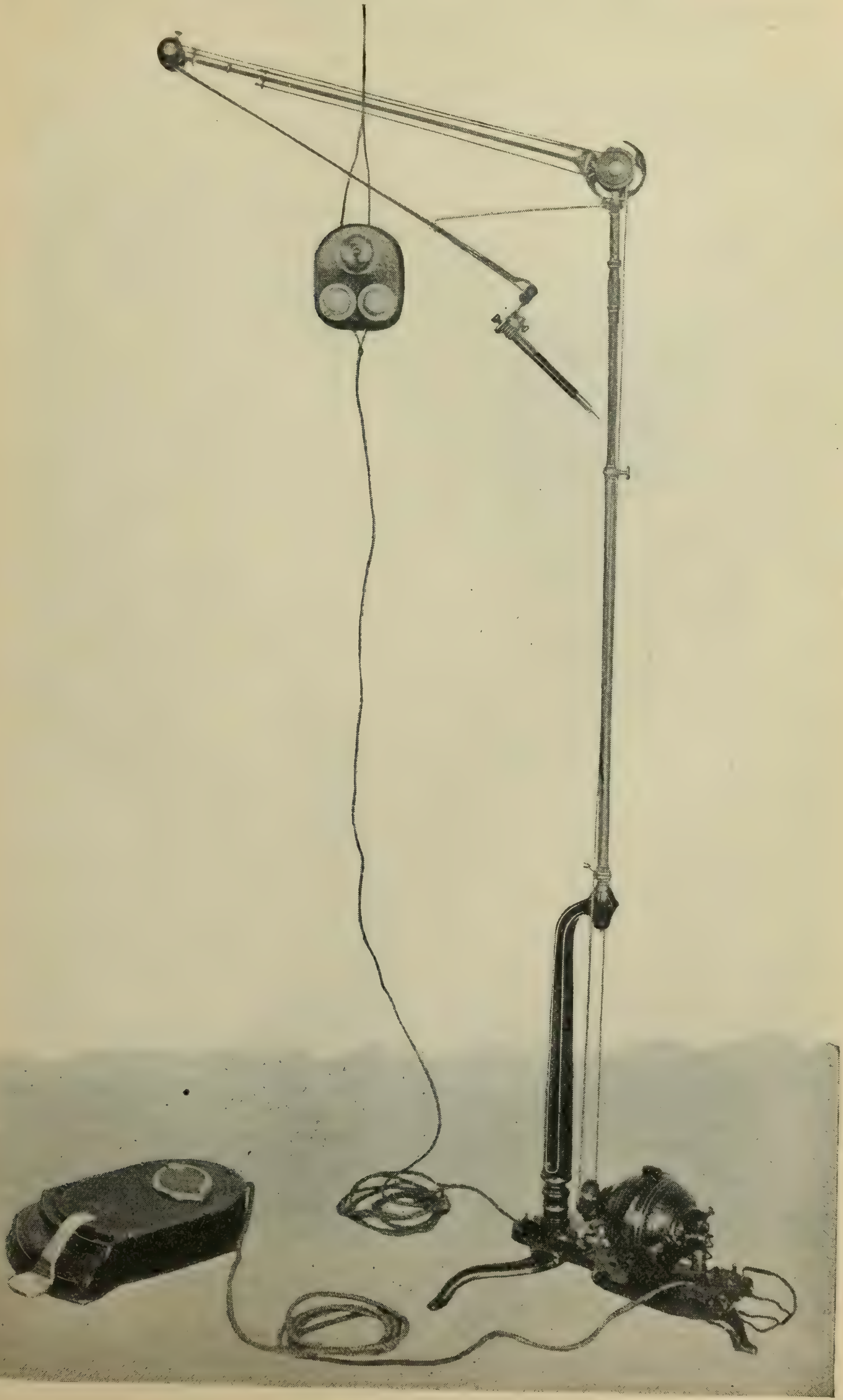
All these outfits provided with S. S. White flexible arms and hand-pieces, can be supplied with slip-joint and duplex spring, permitting mechanical mallets to be readily attached.

# The S. S. White New Treadle-Rheostat Outfit.

With Wall-Switch E, Special Standard, Doriot Arm, and Hand-Piece A.

**For 110-Volt Direct Current.**

Patented Aug. 15, 1893; Aug. 22, 1893; July 24, 1894; Dec. 6, 1887. (Nos. 374,221, 374,225.)



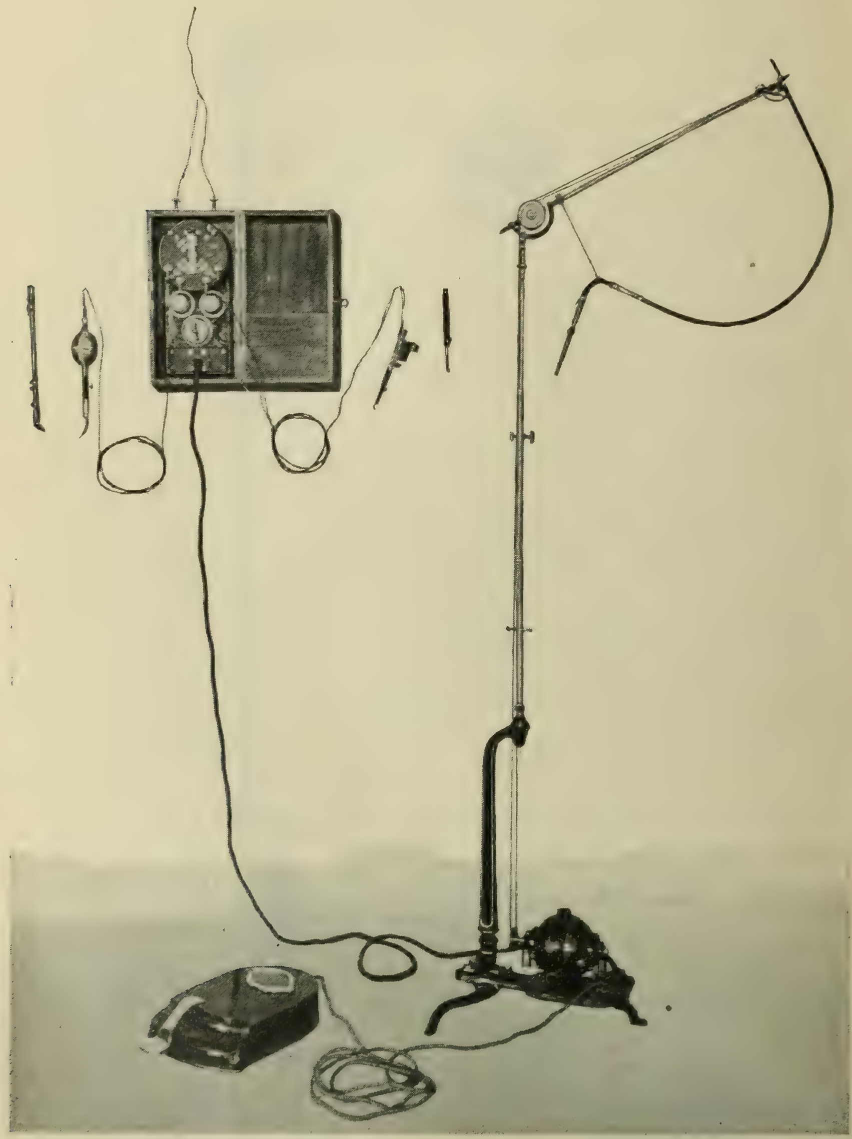
This Outfit can be supplied with Transformer in place of Wall-Switch E. For prices, see page 10.

# The S. S. White New Treadle-Rheostat Outfit.

## For 110-Volt Direct Current Circuits.

**With Transformer and Special Motor for Operating Engine, Electric Mallet, Mouth-Lamp, Cautery, Hot-Air Syringe, etc.**
**Cord Engine, Standard and Upper Arm, S. S. White Engine-Head, Flexible Arm, No. 2 Slip-Joint, Duplex Spring, and No. 7 Hand-Piece.**

Patented January 7, 1890; August 15, 1893; July 24, 1894; July 6, 1880; December 6, 1887 (Nos. 374,221, 374,225).



This Outfit can be furnished with Wall-Switch E in place of Transformer, or with any other S. S. White Hand-piece.

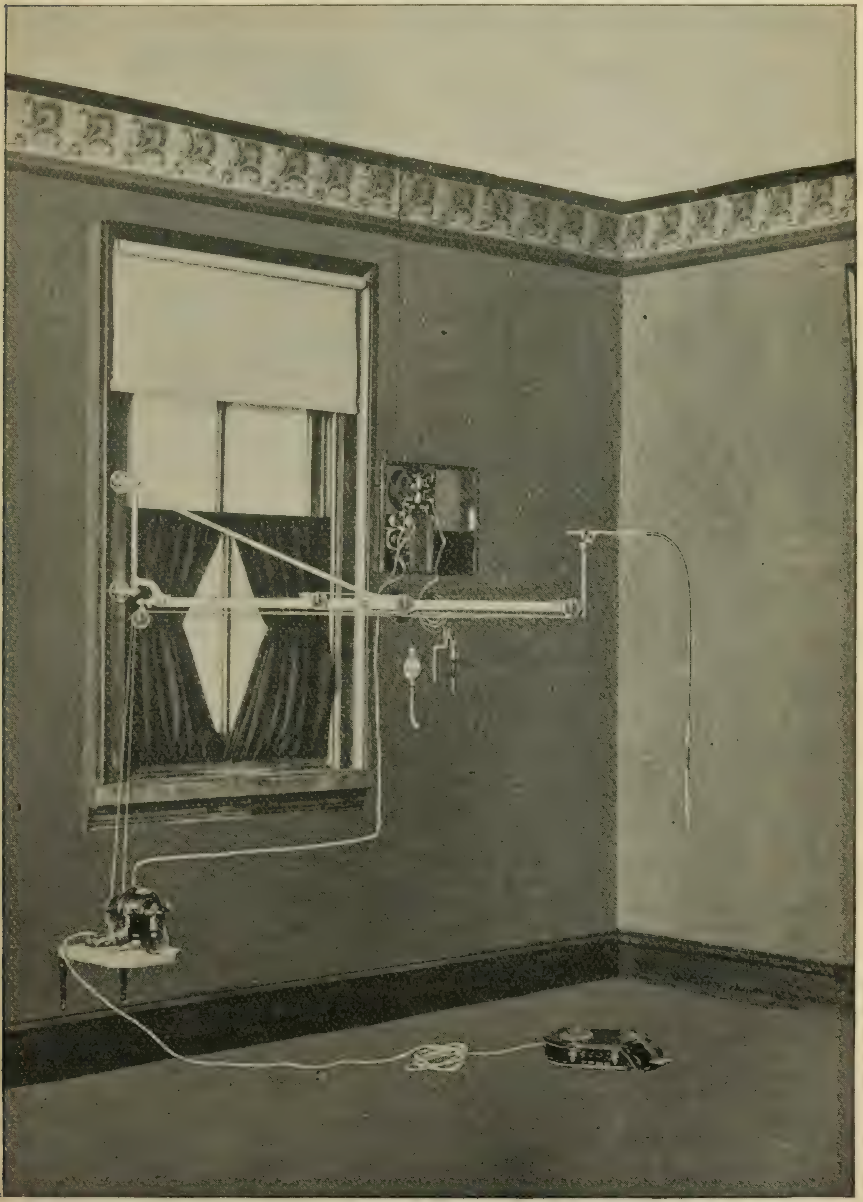
For prices, see page 10.

# The S. S. White Treadle-Rheostat Outfit and Transformer.

### For 110-Volt Direct Current.

With No. 2 Engine Wall-Bracket, S. S. W. Engine-Head, Flexible Arm, No. 2 Slip-Joint, Duplex Spring, and No. 7 Hand-piece.

Patented July 6, 1880; Jan. 7, 1890; Aug. 15, 1893; May 15, 1894; July 3, 1894; July 24, 1894.



This Outfit can be furnished with Wall-Switch E in place of Transformer, or with Doriot, Weber-Perry, or Shaw Arm in place of S. S. W. Arm.

For prices, see page 10.

**The S. S. White Flexible Arm, as supplied with these outfits, now includes the Duplex Spring and Flexible Arm Support, as advertised in the DENTAL COSMOS for September.**

# NEW TREADLE-RHEOSTAT OUTFIT.

PRICES.

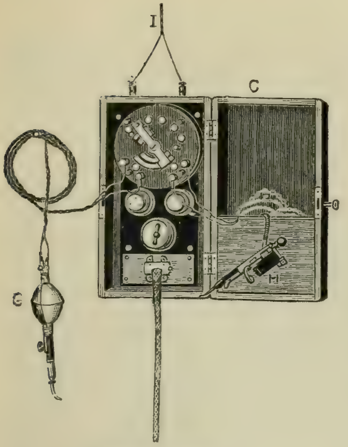
WHEN FURNISHED WITH WALL-SWITCH E.

| | | |
|---|---|---|
| Treadle-Rheostat with Cable and Contact Plate | $45.00 | |
| Special 110-Volt Motor A with extra brushes, etc. | 40.00 | |
| Wall-Switch E with Connecting Cords | 5.00 | |
| | 90.00 | |
| No. 3 Motor Stand | 15.00 | $105.00 |
| The S. S. White Standard Pulley-Head, Flexible Arm, with Duplex Spring, new Arm Support, and Hand-Piece | 29.00 | |
| Treadle-Rheostat Outfit and No. 3 Motor Stand | 105.00 | $134.00 |
| The S. S. White Pulley-Head, Flexible Arm with Duplex Spring, new Arm Support, and Hand-Piece attached to Cord Engine Standard and Upper Arm, as shown on page 8, with Wall-Switch in place of Transformer | $44.25 | |
| Treadle-Rheostat Outfit and No. 3 Stand | 105.00 | $149.25 |
| The new Doriot Engine Arm and Hand-Piece A with Special Standard to attach to No. 3 Stand, as shown on page 7 | $48.00 | |
| Treadle-Rheostat Outfit and No. 3 Stand | 105.00 | $153.00 |
| The Weber-Perry Cord Engine and Standard | $43.50 | |
| Treadle-Rheostat Outfit and No. 3 Stand | 105.00 | $148.50 |
| The Shaw Engine-Arm, S. S. W. Hand-Piece and Standard | $32.00 | |
| Treadle-Rheostat Outfit and No. 3 Stand | 105.00 | $137.00 |
| The Improved S. S. White No. 2 Engine Wall Bracket, with Compensating Pulleys | $40 00 | |
| Doriot Arm and Hand-Piece | 40.00 | |
| Treadle-Rheostat Outfit without Stand | 90.00 | $170.00 |
| The Improved S. S. White No. 2 Engine Wall Bracket, with Compensating Pulleys | $40 00 | |
| S. S. White Pulley-Head, Flexible Arm, with Duplex Spring, New Arm Support, and Hand-Piece, as shown on page 9, with Wall-Switch in place of Transformer | $25.00 | |
| Treadle-Rheostat Outfit without Stand | 90 00 | $155.00 |
| The S. S. White No. 2 Engine Wall Bracket, without Compensating Pulleys | 35.00 | |
| S. S. White Arm with Duplex Spring, new Arm Support, and Hand-Piece for direct connection to Motor | $19.25 | |
| Direct Coupler to connect Arm to Motor | 5.00 | |
| Treadle-Rheostat Outfit without Stand | 90.00 | |
| S. S. White Iron Wall Bracket to hold Motor | 10 00 | $124.25 |
| The Elliott Suspension Engine for ceiling, with improved Hand-Piece | $33.00 | |
| Treadle-Rheostat Outfit without Stand | 90.00 | $123.00 |
| Crane, extra | 5.00 | |
| No. 2 Slip-Joint | $7.50 | |
| Tripod for Motor, when used without No. 3 Stand | 1.50 | |
| Shelf with Iron Brackets for holding Motor | 1.50 | |

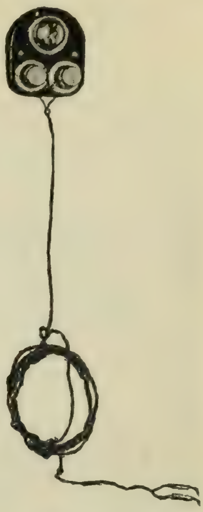
**The Transformer, with plain front substituted for Wall-Switch E, adds $30.00 to the above prices. Glass front Transformer adds $32.00.**

(For description and prices of Transformers, see page 11.)

# The S. S. White Transformer for Operating Accessories on No. 2 Motor Stand and Treadle-Rheostat Outfits.



Transformer.



Wall-Switch E.

**The new S. S. White Transformer** is an appliance which furnishes (when connected to the No. 2 Motor Stand Outfit as now made, or to the new Treadle-Rheostat Outfit) a low-volt alternating current for operating the new alternating Electric Mallet, Mouth-Lamp, Hot-Air Syringe, and Cautery.

The special motors used with these outfits have an extra pair of brushes and collecting rings, and supply an alternating current which is sent through the Transformer, where by induction it generates a secondary current to operate the accessories. This secondary current has no connection with the street circuit, and on account of its low voltage is perfectly harmless in the mouth.

NOTE.—*This attachment, although furnishing an alternate current, does not change the motor into an alternate-current motor, nor fit it to run from an alternate current, such as that furnished for street-lighting.*

The Transformer, Wall-Switch, Fuse-Plugs, and Connecting Plate are inclosed in a mahogany case, 7¼ inches wide, 13⅜ inches high, and 6⅜ inches deep, which is to be fastened to the wall near the chair. The door of the case, which is fastened with lock and key, has a pocket on the inside to hold the accessories when not in use. With the door closed, the entire apparatus is out of sight, and is therefore secure from being tampered with.

On the top of the Mahogany Case are two binding posts, to which are connected the mains from the supply circuit.

On the slate front of the Transformer are two pairs of binding posts for the cords from accessories, and a current regulating switch with contacts.

The left-hand pair of posts are for Cautery and Hot-Air Syringe, the right-hand pair for Mallet and Mouth-Lamp. *Always connect up as directed.*

A four-cord cable, with contact plates at each end, is furnished to connect Transformer to Motor Stand.

If the outfit is to be used without the Transformer, the Wall-Switch E is used to connect the Motor to the circuit.

PRICES.

| | |
|---|---|
| Transformer with Plain Front and Cable . . . . . | $35.00 |
| " " Mirror " " " . . . . . | 37.00 |
| Wall-Switch with two Fuse Plugs and Connecting Cords . | 5.00 |

# The S. S. White 220-Volt Special Reducing Resistance.

The S. S. White 220-Volt Special Reducing Resistance is an iron and enamel fire-proof rheostat, to permit the preceding outfits to be operated from 220-volt direct currents. It gives them the same currents and speeds they would have on the 110-volt circuit without it, and prevents the excessive sparking at Treadle contacts which would otherwise occur with 220 volts.

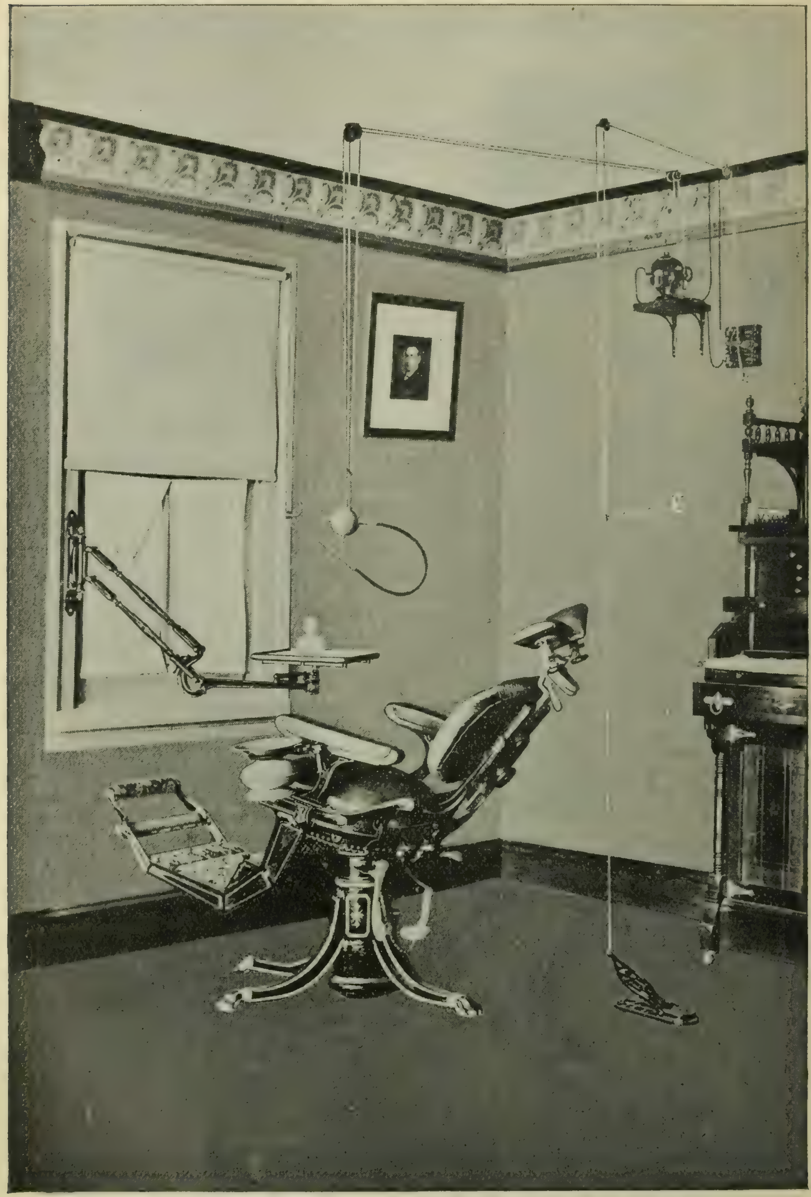
| | |
|---|---|
| Price . . . . . . . . . . . . . | $18.00 |

# The Williamson Suspension Dental Engine.

Patented April 12, 1892.

**With the 110-volt Direct Current, the Treadle-Rheostat and 110-volt Motor can be used in place of Foot-Treadle, Motor, and Resistance shown.**

(See prices, page 10.)



The Williamson Suspension Dental Engine, operated by the electrical current, is entirely still-running, and has the freedom of motion inherent to the suspension form, which contributes materially to delicacy of manipulation.

A hollow sphere has a shaft journaled through its center, to which is attached an S. S. White flexible arm The sphere is parted at the middle by a slip-joint, the two halves being held together by a screw at the bottom. Within one half of the sphere the shaft carries the pulley, the wall of the other half being thickened as a counterbalance for the arm and hand-piece.

The driving-cord reaches the pulley through two tubes let into the top of the sphere, thence it passes over pulleys at the point of suspension, and from there by means of guide-pulleys to the motor. Attached to the frame of the suspension pulleys is an adjustable safety-cord (seen in the cuts between the going and returning driving-cord), which runs to the inside of the sphere, for the purpose of sustaining the engine in case of breakage of the driving-cord.

At the bottom of the sphere is a hook to hold the hand-piece when not in use. An additional hook is furnished, to be attached to the wall at any convenient point to permit the entire engine to be swung out of the way.

The sphere, which is of brass, nickel-plated, is 3¼ inches in diameter, outside measurement. The entire weight of the engine, including sphere, arm, and hand-piece, is about 2 pounds 6 ounces.

This engine can be driven by the No. 2 Motor Stand Outfit, the new Treadle-Rheostat Outfit, or any motor connected to a speed-regulating Resistance and controlling Treadle.

Whatever current is used, the engine can be suspended from the ceiling or from a crane. The former is the more desirable wherever it is practicable; but where there are great difficulties in the way of the adoption of this plan, as a very high ceiling, the crane may be used.

We recommend as the best combination for use on the 110-volt current, the Treadle-Rheostat Outfit, consisting of Treadle-Rheostat, Motor with tripod on shelf, and Wall-Switch E (similar to illustration on page 11).

## REDUCED PRICES OF THE WILLIAMSON ENGINE.

| | |
|---|---|
| Williamson Engine, including Arm, Hand-piece, and two Ceiling Pulleys | $27.00 |
| Treadle-Rheostat, Special Motor A for operating Transformer with Tripod, on shelf, and Wall-Switch E | 93.00 |
| | $120.00 |
| Special Crane, for use with high ceilings | 8.50 |

| | |
|---|---|
| The Williamson Engine, as above | $27.00 |
| No. 2 Motor Stand Outfit, with Wall-Switch E | 145.00 |
| | $172.00 |
| Crane extra | 8.50 |
| Plain Transformer in place of Wall-Switch, adds | 30.00 |
| Glass Front Transformer in place of Wall-Switch, adds | 32.00 |

| | |
|---|---|
| The Williamson Engine, as above | $27.00 |
| Treadle-Rheostat with Special Motor "B," without Transformer Attachments, with Tripod, Shelf, and Wall-Switch E | 81.00 |
| | $108.00 |

The Transformer cannot be used with this Outfit.

| | |
|---|---|
| Crane extra | 8.50 |

## Williamson Suspension Engine Outfit for High-Volt Current.

As illustrated on page 12.

### PRICES.

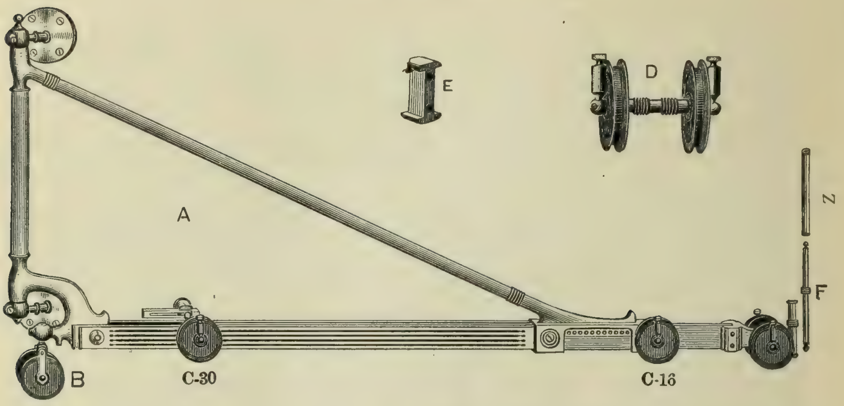
| | |
|---|---|
| Williamson Engine, including Arm and Hand-piece and two Ceiling Pulleys | $27.00 |
| Treadle, with Clamping Pulley, Guide Pulley, Sliding Finger-Hold, 30 yards Maroon Cord, 12 feet Check Cord, and Spring for Switch-Lever | 7.00 |
| | $34.00 |

The prices for High-Volt Current Outfit include everything that it is necessary to purchase when the electrical companies furnish and install the motor and rheostat, as they generally prefer to do on arc and other high-voltage circuits. We therefore do not quote prices for these, though we will do so on request, but in such cases we must have full particulars as to voltage and character of current.

### THE NEW S. S. WHITE

# No. 2 Engine Wall Bracket.

Patented July 3, 1894.



This is handsome, strong, rigid, all metal, and nickel-plated. It is altogether the finest bracket yet produced. The brackets heretofore made, while giving good satisfaction with the S. S. White Engine-Head and Flexible Arm, have been found not to have sufficient rigidity to satisfactorily support other engine-arms, such as the Weber-Perry, Shaw, or the new Doriot. The new bracket entirely overcomes this objection.

Length from the wall when closed is 36½ inches, including supports. The slide, which extends 19 inches, makes the extreme length 55½ inches. The complete bracket includes two belt compensating pulleys, C-16 and C-30, which automatically keep the belt tight at any position of the bracket.

Where it is desired to permanently use the bracket at some particular length, these two pulleys can be omitted, and guide E takes the place of pulley C-30.

With this arrangement the sliding of the bracket acts as a belt tightener, while in the previous case the pulley C-30 is adjustable for this purpose. The bracket can be fitted at the wall end with either pulleys B as shown, or D.

Pulleys B carry the cord downward, and are used with a motor below the bracket. Pulleys D extend slightly on each side of the bracket, and permit the cords to be carried above them. By using our universal pulleys the motor can be placed in any part of the room. The socket at the end of the bracket takes the new Doriot Arm. Adapter F is used with the Cord Engine-Arm or Shaw Arm. When the S. S. White Pulley-Head and Flexible Arm are used, the tube Z is first slipped over the adapter F, to raise the pulley-head and allow the belt more play.

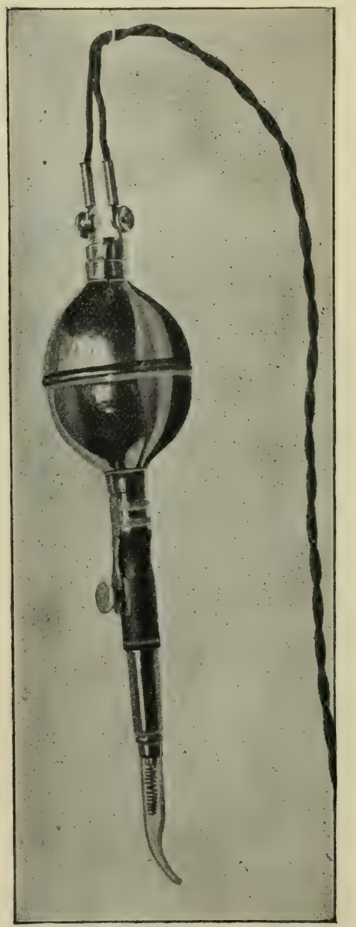
Unless otherwise ordered, the bracket will be furnished with compensating pulleys C-16 and C-30 and Pulleys B.

| | |
|---|---|
| Price, complete . . . . . . . . . . | $40.00 |
| Without Pulleys C-16 and C-30, but with either pulleys B or D | 35.00 |

# ELECTRIC HOT-AIR SYRINGE.

Patented September 25, 1894.

### Nos. 1 and 2.



Our new Electric Hot-Air Syringe is a convenient and time-saving appliance, and can be used with our new Transformer, Storage Batteries, the Partz Motor Battery No. 6, or the Edison-Lelande Battery.

As it is unnecessary to speak of the value of the hot-air blast in dental operations, we confine ourselves to a brief description of the Syringe.

In appearance and size, the No. 1 closely resembles our well-known patent Carbon Hot-Air Syringe, but has a glass tip, within which is a coil of platinum wire heated by the electric current. A switch under the thumb makes the circuit and gives the dentist an instant current of heated air, on compressing the rubber bulb, which can be regulated from slightly warm to the hottest blast.

Different sized nozzles can be screwed on, giving fine or diffused jets of air; and as glass is a poor conductor of heat, the handle remains cool while the air loses none of its heat.

The No. 2 has a hard rubber handle, with a metal tube running through it, and a nipple to connect a rubber hose. It is to be used with a cylinder of gas or compressed air.

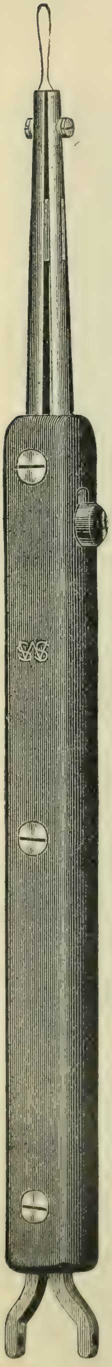
| | |
|---|---|
| Price, Nos. 1 or 2 . . . . . . . . . . | $15.00 |

We can add to the rubber bulb, the handle with tube and tip for attaching rubber hose and using a blast from nitrous-oxid cylinder or foot bellows.

| | |
|---|---|
| Price . . . . . . . . . . . . . . | $5.00 |

**Voltage, 3 to 4 volts; Current, 4½ amperes.**

# IMPROVED DENTO-ELECTRIC CAUTERY.



The principal improvement consists in the introduction of a more efficient and convenient means of closing the circuit. The handle also is increased in length and its shape modified to a more convenient form.

As a means of obtunding sensitive dentine electricity stands high with those who have used it. Dr. J. Foster Flagg's opinion of it is shown in the following:

106 N. Eleventh St., Phila., March, 1885.

The S. S. White Dental Mfg. Co.

Gentlemen: It is now more than ten years since I have accepted and used the Dento-Electric Cautery as the substitute for heated burnishers in treating sensitivity of dentine.

With this instrument, a "*rapid though deliberate* passing of the looped wire across the sensitive spots upon the worn or atrophied articulating faces of bicuspids and molars will often produce an immunity from suffering of quite gratifying length of duration."

In my papers on "Dental Pathology and Therapeutics" I felt it "imperative" to direct attention to this means as the "promptest of all continuously effective obtunders," and as one which would "sometimes meet the indications in certain cases where nothing else will give relief."

I therefore recommend your Dento-Electric Cautery, in the belief that its use will prove beneficial in a class of cases where other applications have been unavailing.

Truly yours,

J. Foster Flagg.

In the improved Cautery a loop of platinum wire (No. 26, B. & S. gauge) is held by set-screws in contact with metal conductors which pass through a hard-rubber handle, the battery wires being coupled to terminals at the end of the handle.

In use the appliance is held in the hand somewhat after the manner of a pen or pencil in writing, and the platinum loop, when properly heated by the electric current, is passed back and forth over the sensitive dentine. The circuit is closed by pressing the button near the forward end of the handle, and pushing it forward. This locks it with the circuit closed, which can be broken again by pulling the button back to its original position. The loop, when destroyed, is readily and inexpensively replaced.

This cautery is designed to be operated by the new Transformer (page 11). It can also be used with one or two cells of a storage battery, or with four cells of the Partz Motor Battery No. 6 arranged two in series and two on multiple, or with six or eight cells of the Edison-Lelande Battery.

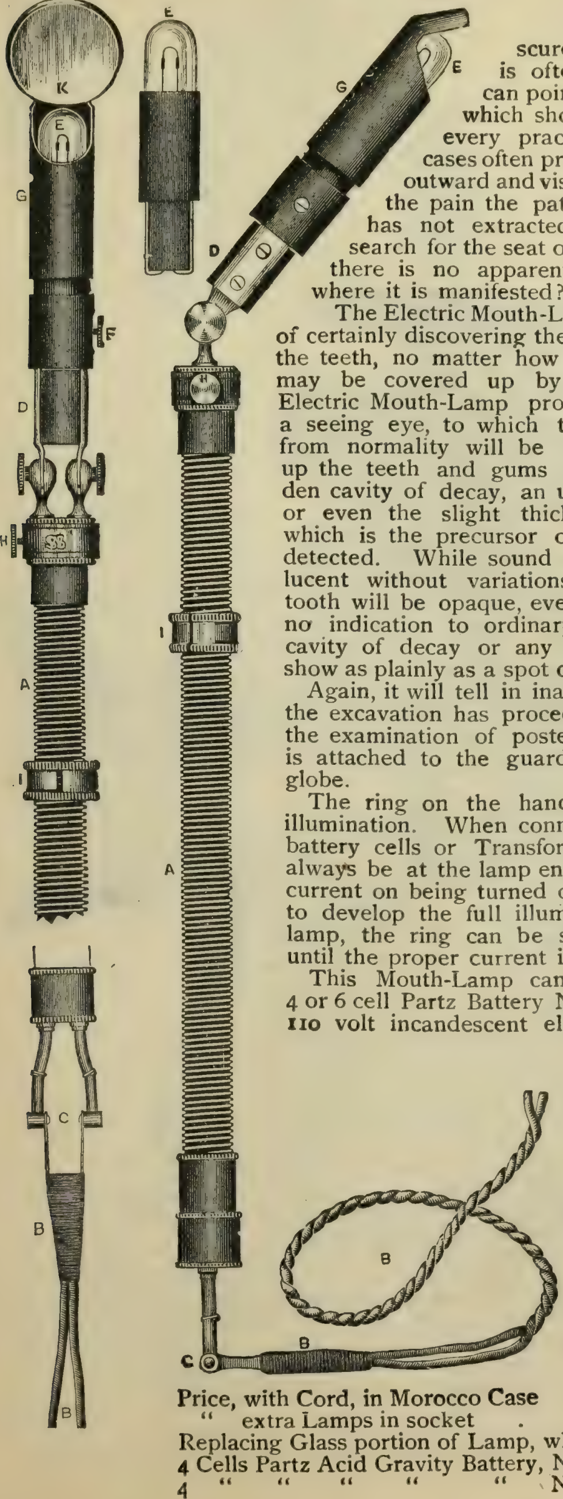
**Voltage 3 to 4 volts; Current 10 amperes.**

PRICE.

| | | |
|---|---|---|
| Without Conducting Cord | | $8.00 |
| With " " | | 9.50 |
| Extra Platinum Loops | each | .10 |
| 4 Cells Partz Motor Battery, No. 6 | | 18.00 |

# ELECTRIC MOUTH-LAMP AND LARYNGOSCOPE.

Patented June 10, 1884; June 17, 1884 (Nos. 300,523, 300,524, and 300,525); March 10, 1885 (Nos. 313,782 and 313,783).



Exact diagnosis in obscure lesions of the teeth is often difficult. Anyone can point out a cavity of decay which shows for itself. But, as every practicing dentist knows, cases often present where there is no outward and visible sign to account for the pain the patient suffers; and who has not extracted sound teeth in the search for the seat of a neuralgia for which there is no apparent cause at the point where it is manifested?

The Electric Mouth-Lamp supplies the means of certainly discovering the offender if it is among the teeth, no matter how deftly its hiding-place may be covered up by reflex action. The Electric Mouth-Lamp provides the dentist with a seeing eye, to which the slightest departure from normality will be discernible. It lights up the teeth and gums so strongly that a hidden cavity of decay, an unsuspected dead pulp, or even the slight thickening of the tissues which is the precursor of decay, is unerringly detected. While sound teeth will appear translucent without variations in texture, a dead tooth will be opaque, even when its color gives no indication to ordinary observation; and a cavity of decay or any foreign substance will show as plainly as a spot on a window-pane.

Again, it will tell in inaccessible cavities when the excavation has proceeded far enough. For the examination of posterior cavities, a mirror is attached to the guard in front of the lamp-globe.

The ring on the handle is to regulate the illumination. When connecting the lamp to the battery cells or Transformer this ring should always be at the lamp end of the handle. If the current on being turned on is found insufficient to develop the full illuminating power of the lamp, the ring can be slid down the handle until the proper current is found.

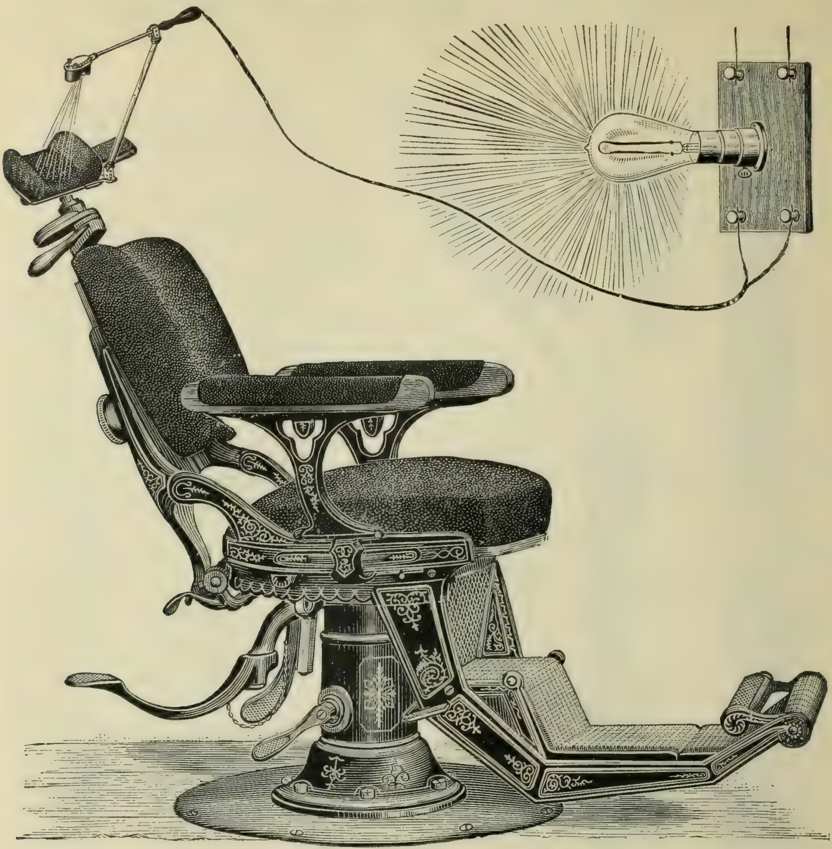
This Mouth-Lamp can be operated from a 4 or 6 cell Partz Battery No. 1 or No. 4, from the 110 volt incandescent electric light circuit by using the Mallet Rheostat or the No. 2 Motor Stand Outfit with Transformer, and from the Edison-Lelande Battery Motor Outfit with Combination Rheostat.

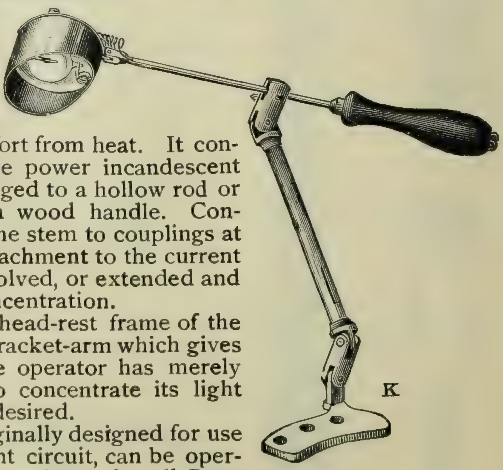
**Voltage, 4 volts; Current, 1 ampere.**

| | |
|---|---|
| Price, with Cord, in Morocco Case . . . . . | $10.00 |
| " extra Lamps in socket . . . . . each | 2.00 |
| Replacing Glass portion of Lamp, when broken . | 1.75 |
| 4 Cells Partz Acid Gravity Battery, No. 1 . . . . | 14.00 |
| 4 " " " " " No. 4 . . . | 6.00 |

# ELECTRIC MOUTH-ILLUMINATOR.

## With Lamp Resistance for 110-Volt Circuit.





With this appliance the oral cavity can be illuminated more perfectly than with any other device heretofore tried, without affecting the eyes of the operator or patient, and without the slightest discomfort from heat. It consists of an Edison five-candle power incandescent lamp in a hooded casing, hinged to a hollow rod or stem, which terminates in a wood handle. Conducting-wires pass through the stem to couplings at the end of the handle for attachment to the current wire. The hood may be revolved, or extended and made deeper for greater concentration.

It is to be attached to the head-rest frame of the chair by means of a hinged bracket-arm which gives it universal adjustment. The operator has merely to adjust the Illuminator to concentrate its light upon the part of the mouth desired.

This appliance, though originally designed for use with the Edison incandescent circuit, can be operated with a primary battery,—about six-cell Partz battery. When run by the incandescent current, an excellent resistance may be provided by coupling the Illuminator in series with a thirty-two-candle power lamp as shown. (The bracket support K is now made in two styles to fit either the Wilkerson or the Watkins Head-rest. Always mention which Head-rest in ordering.) The large lamp will illuminate the entire office.

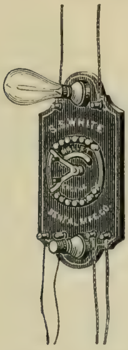
| | |
|---|---|
| Price, Electric Mouth-Illuminator, including Bracket and seven feet Conducting Cord . . . . . . . | $15.00 |
| " Resistance Lamp, mounted on Walnut Block, extra. | 4.00 |

We can furnish Illuminator for 52-volt current. Prices on application.

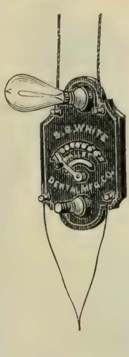
# NEW IRON AND ENAMEL RHEOSTATS

For 110-volt Current,

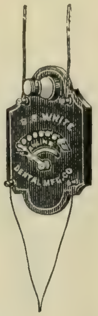
FOR KELLS SYSTEMS Nos. 2, 3, 4, AND 5.



Double Rheostat.



Single Rheostat for Mallet.



Single Rheostat for Engine.

| | |
|---|---|
| Double Rheostat for Engine, Mallet, and Mouth-Lamp, with 50 c. p. lamp | $43.00 |
| Single Rheostat for Engine | 25.00 |
| Single Rheostat for Mallet, with 50 c. p. lamp | 28.00 |

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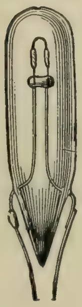
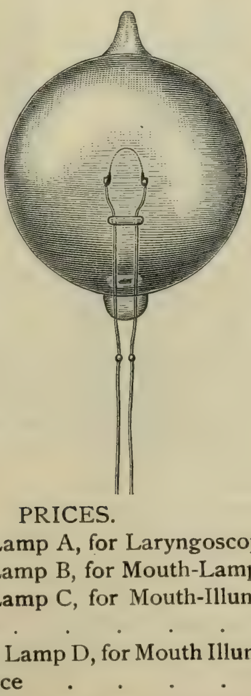
# ELECTRIC INCANDESCENT LAMPS.

A

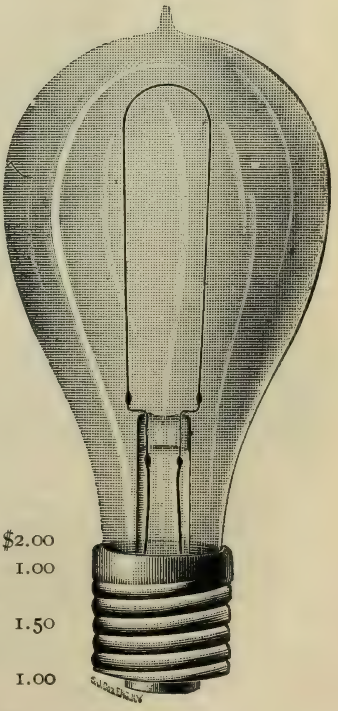
B



C



D

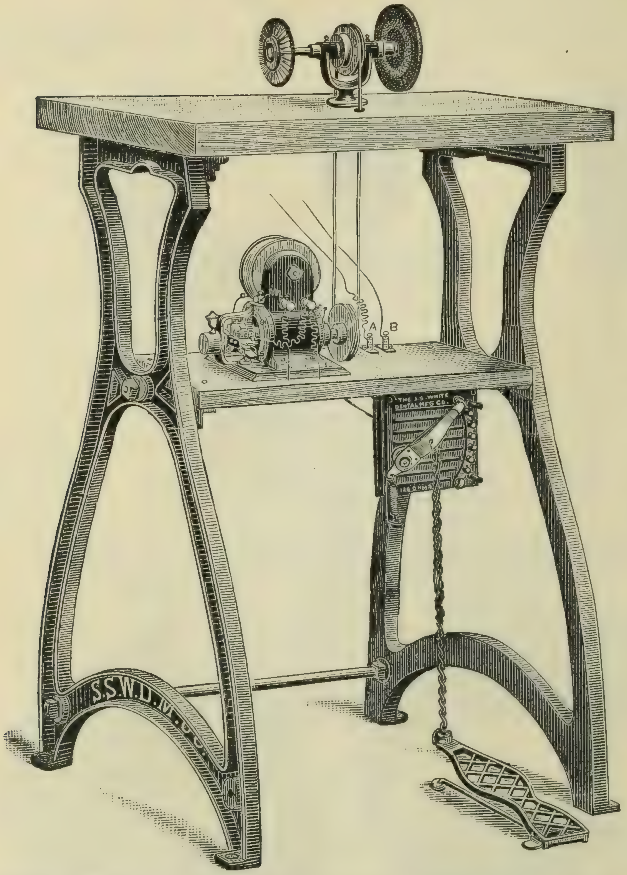


PRICES.

| | |
|---|---|
| ½ Candle, 4 volt, Lamp A, for Laryngoscope | $2.00 |
| ½ Candle, 4 volt, Lamp B, for Mouth-Lamp | 1.00 |
| 5 Candle, 7 volt, Lamp C, for Mouth-Illuminator | 1.50 |
| 32 Candle, 110 volt, Lamp D, for Mouth Illuminator Resistance | 1.00 |
| 50 Candle, 110 volt, Lamp like D, for Resistance for Electric Mallet | 1.35 |

# ELECTRIC LABORATORY LATHE.

**Arranged to operate on the 110-volt Current**



Height of stand to top of ash slab, 39½ inches; slab, 26 x 20 x 1⅝ inches; floor space required, 26 x 25 inches. Frame of stand iron.

One of the most useful applications of electricity to the needs of the dentist is in the running of laboratory lathes by the incandescent current. A motor of about ⅛-horsepower is required. Such a motor with a 110-volt incandescent current will run a lathe for dental laboratory work more satisfactorily than any other power at present known to us. A Variable Resistance is interposed to permit the Lathe to be run at different speeds. The Resistance is operated by a foot-pedal.

The wires attached to the binding-posts A, B, are for connection with the incandescent current; and the free ends of the wires which pass through the shelf immediately in front of the motor are attached to the motor binding-posts. The circuit is closed and the Lathe operated by pressing the pedal, which is pivoted to the floor. Almost any desired speed can be had at will by varying the pressure on the pedal.

The Resistance can be operated by the hand by placing it under the table top, and dispensing with the pedal and the spring of the Resistance lever.

## PRICES.

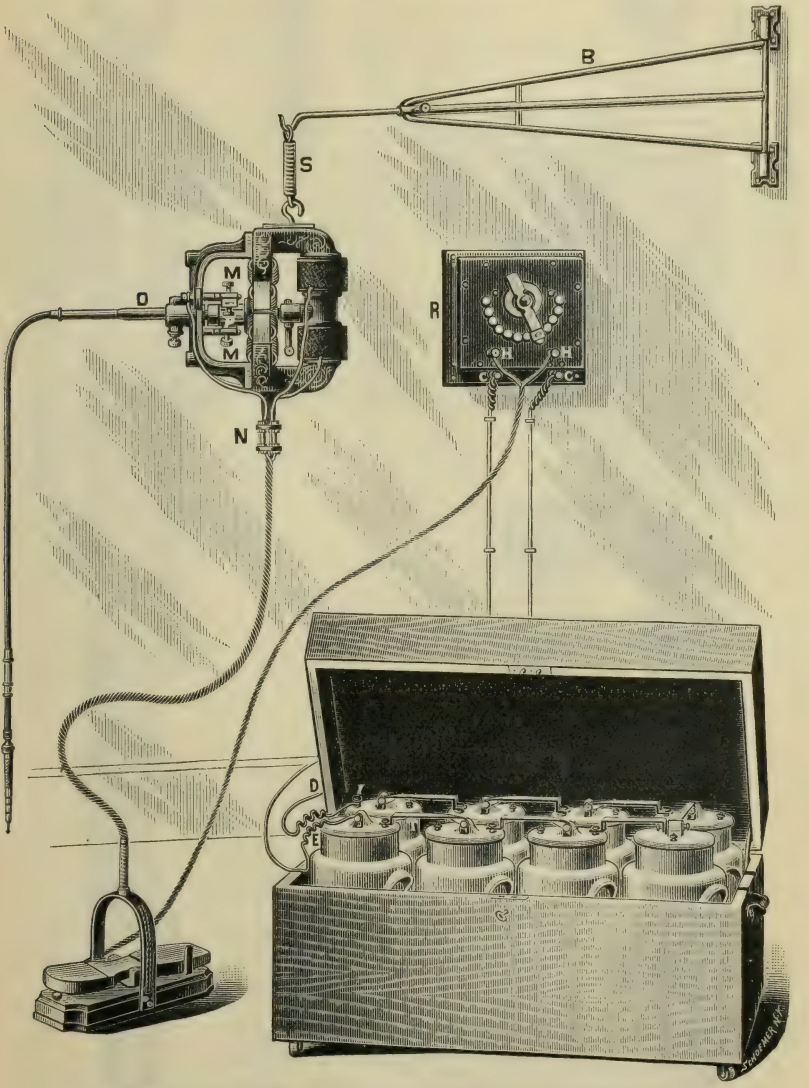
| | |
|---|---|
| Electric Laboratory Lathe complete, including Clutch Lathe-Head and 10 Mandrels, Lathe-Stand, ⅛ Horse-Power Rhodes Motor, Variable Resistance, and Foot-Pedal | $64.50 |
| Other Motors and other Lathe-Heads can be substituted at value. | |
| Boxing | 2.00 |

### PARTS SEPARATELY.

| | |
|---|---|
| Clutch Lathe-Head, with 10 Mandrels | $13.00 |
| Lathe-Stand | 10.00 |
| 110-Volt Lathe Motor | 28.00 |
| New Iron and Enamel Variable Resistance | 12.00 |
| Foot-Pedal | 1.50 |

# Electric Battery Dental Outfit.

**For Situations where no Supply Current can be Obtained, using the Edison-Lelande Batteries and the S. S. White Flexible Arm and Hand-Piece.**



Size of box, 2 feet 10 in. long, 1 foot 6 in. wide, 1 foot 6¾ in. high.

| | |
|---|---|
| Prices as shown, with Motor Rheostat | $110.00 |
| " with Combination Rheostat | 114.00 |
| Omitting Oak Box deducts from either outfit | 10.00 |
| Complete recharge for eight cells Edison-Lelande Battery | 18.00 |

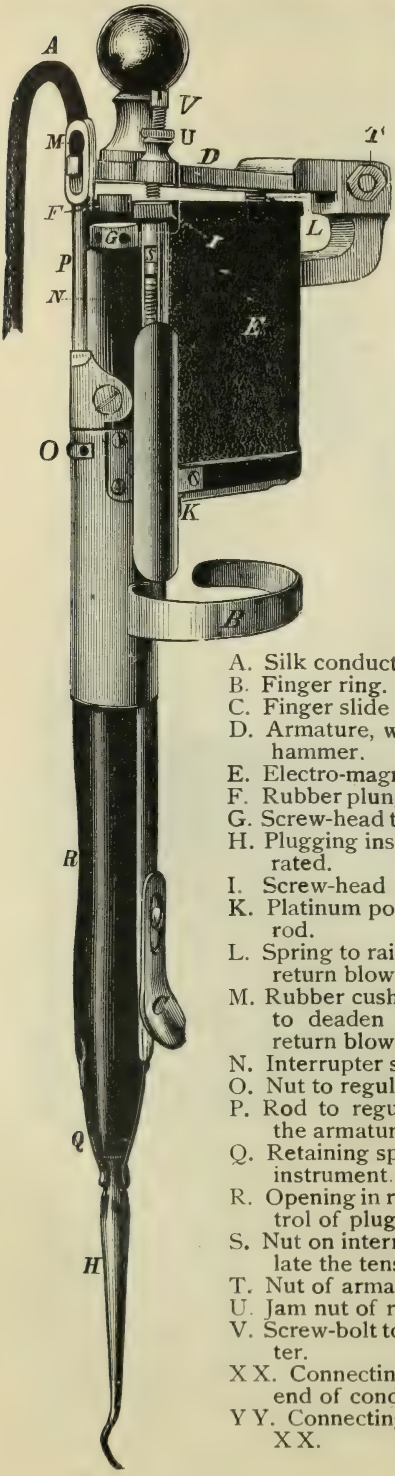
The Combination Rheostat enables the Mallet, Mouth-Lamp, Hot-Air Syringe, and Cautery to be used on this outfit.

This outfit with New Flexible Arm Support, and Duplex Spring instead of Cable Spring attachment, adds $2.75 to the above prices.

☞ **Send for Descriptive Circular and Testimonials.**

# The Bonwill Electro-Magnetic Mallet.

Fig. 1.



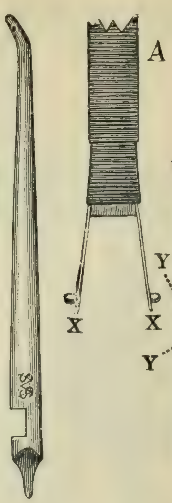
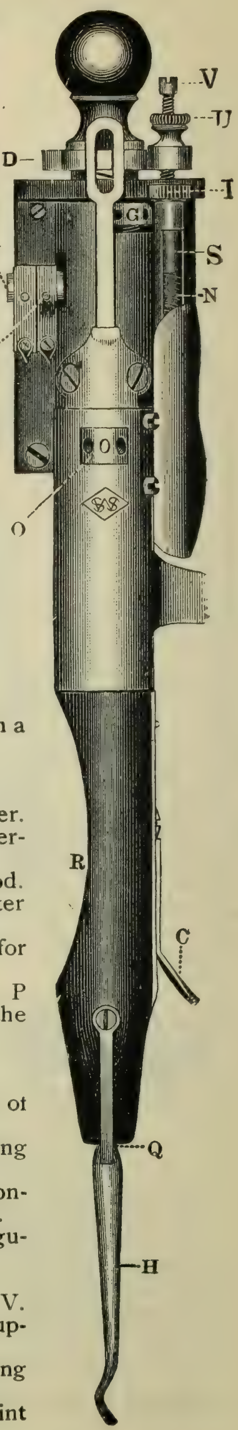


Fig. 2.



A. Silk conducting cord.
B. Finger ring.
C. Finger slide to close circuit.
D. Armature, weighted to form a hammer.
E. Electro-magnets.
F. Rubber plunger.
G. Screw-head to regulate plunger.
H. Plugging instrument, finely serrated.
I. Screw-head of interrupter rod.
K. Platinum points of interrupter rod.
L. Spring to raise the armature for return blow.
M. Rubber cushion in the stem P to deaden the sound of the return blow of the hammer.
N. Interrupter spring.
O. Nut to regulate rod P.
P. Rod to regulate the stroke of the armature.
Q. Retaining springs for plugging instrument.
R. Opening in rubber stem for control of plugging instrument.
S. Nut on interrupter rod to regulate the tension of spring.
T. Nut of armature hinge-bolt.
U. Jam nut of regulating screw V.
V. Screw-bolt to regulate interrupter.
X X. Connecting points or spring end of conducting cord.
Y Y. Connecting plates for point X X.

# THE BONWILL ELECTRO-MAGNETIC MALLET.

**For use with Battery, 110-volt Direct Current, or S. S. White Transformer.**

Patented Oct. 15, 1878. Reissue July 13, 1880.

This Mallet combines the most valuable inventions of Drs. Bonwill and Webb. It needs no words of encomium to commend it to those who are familiar with its merits. It is indorsed by many of the most skillful operators in the world. When properly understood, it will be found to approach more nearly the ideal condensing instrument than any other ever offered to the profession.

Some of the principal advantages are:

*First.*—The blow is delivered upon the packing-instrument just when its force is greatest, because the attraction of the magnets increases constantly as the mallet approaches them until the circuit is broken.

*Second.*—The force of the blow can at all times be controlled by the operator.

*Third.*—Properly used, it condenses the gold thoroughly and evenly throughout the entire filling.

*Fourth.*—Gold may be impacted against thin, frail walls with ease, and without fracturing the enamel.

*Fifth.*—It saves the operator time and the fatigue attendant upon the use of a hand, automatic, or foot-power mallet.

*Sixth.*—When its operation is understood and the battery is kept in order as per instructions which accompany each Mallet sold, the instrument cannot fail to give satisfaction.

The Mallet requires 6 to 8 volts and ⅜ ampere.

PRICES.

| | |
|---|---|
| Mallet with Connecting-posts, seven feet Silk Cord, one Plugger-Point, Key Wrench, and Leather Case | $35.00 |
| The same, with Four-Cell Partz Acid Gravity Battery in Black Walnut Box (see page 24) | 55.00 |
| The same, with Six-Cell Partz Acid Gravity Battery in Black Walnut Box | 65.00 |
| The same, with Iron Resistance for 110-volt Current (see page 19) | 63.00 |
| Switch for use with Battery | 1.00 |

We can furnish the Electro-Magnetic Mallet, on order, with a socket fixed in the hand-piece to carry points such as are made for the automatic mallets. This style of socket, having a spiral spring inside the hand-piece, dispenses with the use of the springs at Q. Price, $2.00 extra.

Finely-serrated instruments should always be used with the Electro-Magnetic Mallet, the blows being so rapid that ordinary or coarse-serrated instruments will chop the gold.

Full directions accompany each Mallet.

MALLET {without Interrupter, for use with Transformer (see page 11)} $35.00

Mallets already in use can be altered at trifling expense to use with Transformer.

# Partz Acid Gravity Battery.

## For the Bonwill Electro-Magnetic Mallet.

(WHERE CURRENT IS NOT OBTAINABLE.)

No. 1.

Size of Jar, 7¼ in. long, 7¼ in. high, 5½ in. deep.

**E. M. F., 1.9 to 2 volts on open circuit. Current on short circuit: With sulphate of magnesia solution, 3 amperes; with common salt solution, 5 amperes.**

More than eight years' experience demonstrates the superiority of the Partz Acid Gravity Battery for running the Bonwill Electro-Magnetic Mallet. So perfectly is the Battery adapted to the Mallet that it could scarcely have been more satisfactory if it had been devised specially for running it.

Where street current is not available, the Partz makes a perfect substitute for this particular use. If six cells are used, the current is never missed. Four cells will answer for ordinary uses; but we recommend six as more economical in the long run, the additional cells serving not only to keep the electro-motive force up under the severe trials of long-continued operations, but adding to the life of the battery.

Over and beyond its perfect adaptation, the Partz Battery is long-lived; requires to be charged only at long intervals, and is readily and quickly charged when necessary; there is no handling of acid solutions in charging; no appreciable waste when not in use.

The consumption of Sulpho-Chromic Salt by four cells in daily use is from 1 to 2 pounds per month.

### PRICES.

| | |
|---|---|
| Single Cell, complete | $3.50 |
| Set of 4 Cells in Black Walnut Box | 20.00 |
| Set of 6 Cells in Black Walnut Box | 30.00 |

The boxes are neatly finished and provided with handles and outer pole screws. Sold separately at $6.00 and $9.00 respectively.

| | | |
|---|---|---|
| Switch to operate cells | | $1.00 |
| Sulpho-Chromic Salt, 2 pounds, in jar with screw-cap | | .75 |
| Sulphate of Magnesia, in 11-oz. pkgs. | per pkg. | .08 |

***For full description*** *of Partz Batteries, see our recent Partz Battery Catalogue.*

# Nitrous Oxid Gas.

**The Safest Anesthetic Known.**

*It has been used with perfect success in millions of cases.*

**We call attention to the absolute purity of the Gas manufactured by us. The improved processes by which it is made at our laboratories give to the operator certainty and security in its use.**

**We guarantee every cylinder to contain the full quantity of Gas as stated on the label. Each customer can test this for himself by weighing the cylinder when full, and again when empty.**

Our rule with regard to leakage is printed on the tag which accompanies each cylinder, and is as follows: "Weigh this cylinder *as soon as received*. If the weight does not agree with that on the label, return the cylinder *at once*. Otherwise no allowance can be made for shortage." It will thus be seen that we guarantee the cylinder to contain the full quantity of Gas charged, not only when it leaves us, but when it reaches the customer.

The improved Gas Valves now furnished have reduced complaints of leakage to the minimum.

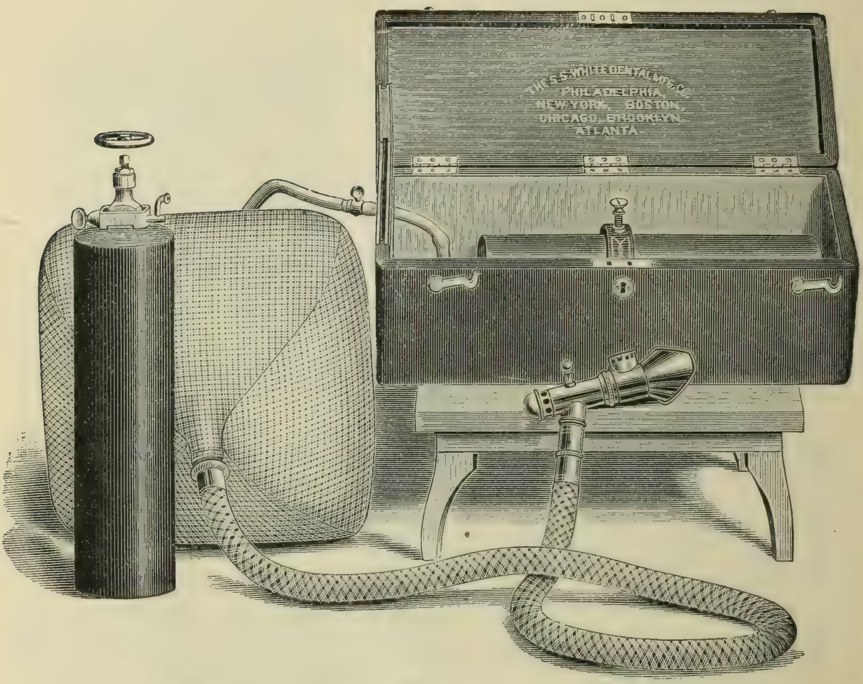
If your local dealer does not furnish our Gas, order direct from either of our houses.

***We do not** fill cylinders of more than 100 gallons capacity, except those made by us.*

# SURGEON'S CASE.

## Nos. 1 and 2.

Patented October 16, 1877; March 25, 1879 (Nos. 213,575 and 213,576).



The complete apparatus consists of an iron cylinder containing at least 100 gallons (usually more) of Nitrous Oxid, liquefied, to which is attached the necessary tubing, with gas-bag and inhaler; the whole inclosed in a stout leather-covered case lined with velvet. The small stop-cock inserted in the tubing between the bag and cylinder enables the operator, after having filled the bag, to shut off the gas and disconnect the bag from the cylinder, if desired for use where it is not convenient to carry the cylinder.

The Case is made of well-seasoned wood, lined with velvet and covered with leather, and the mountings are nickel-plated. A stout cast-steel ring, neatly japanned, with a heavy set-screw, clamps the cylinder.

The No. 1 Case has a 4½-gallon bag; the No. 2 Case a 7-gallon bag.

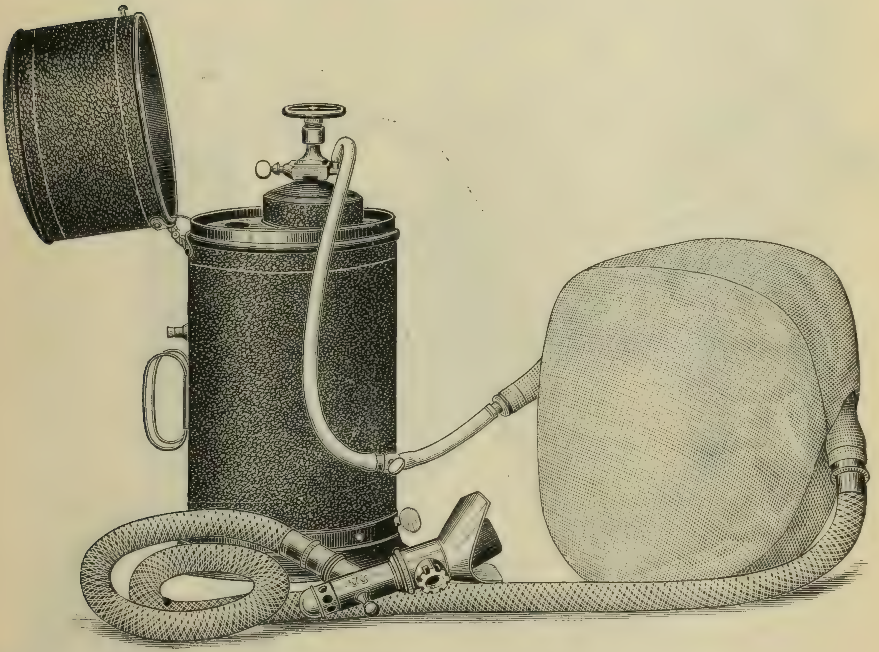
PRICES.

| | |
|---|---|
| No. 1 Case, Complete, with Filled Cylinder . . . . . | $29.75 |
| " 2 " " " " " . . . . . | 31.00 |
| Refilling 100-gall. Cylinder . . . . . . . . | 2.00 |

# UPRIGHT SURGEON'S CASE.

## Nos. 3, 4, 5, and 6.

Patented March 25, 1879 (Nos. 213,575 and 213,576); January 1, 1884.



In this form of Case the cylinder stands on end, which is reckoned by some operators an advantage in permitting a free flow of Gas, but we have had no complaints of the original form as shown in Cases Nos. 1 and 2. To meet all demands, we offer the two forms. The fillings and accessories are the same in the Upright Cases as in the Nos. 1 and 2.

### PRICES.

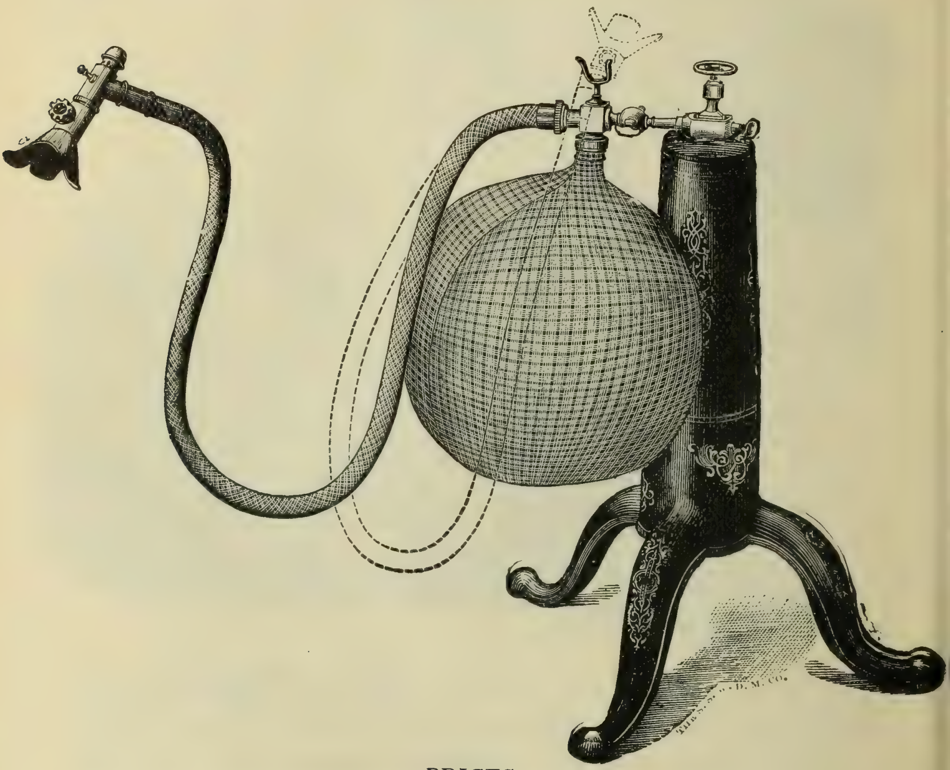
| | |
|---|---|
| No. 3, Complete Apparatus, with 4½-gallon Bag, in stout Tin Case, covered with Leather . . . . . . . | $29.75 |
| No. 4, the same, but with 7-gallon bag . . . . . . | 31.00 |
| No. 5, Complete Apparatus, with 4½-gallon Bag, in stout Tin Case, handsomely Japanned . . . . . . . | 24.75 |
| No. 6, the same, but with 7-gallon Bag . . . . . . | 26.00 |

Inflatable Face-piece on the Inhaler is $4.00 extra; Flexible Face-piece $2.00 extra.

# YOKE ATTACHMENT.

With this appliance the bag is suspended to give free passage to the Gas, and is less liable to damage than when lying upon the table or floor. The metal connections furnished by us will fit this attachment, and any one having the tubing and bag arranged for the Surgeon's Cases can readily transfer them, care being taken to seal up the opening left by the removal of the small inlet tube.

The Yoke is provided with a holder for the inhaler, as shown by the dotted lines.



PRICES.

| | |
|---|---|
| Stand, with Small Cylinder (filled, 100 gals. Gas) and 4½-gal. Bag, complete as shown | $31.00 |
| Stand, with Small Cylinder (filled, 100 gals. Gas) and 7-gal. Bag, complete as shown | 32.25 |
| Stand, with Large Cylinder (filled, 450 gals. Gas) and 4½-gal. Bag, complete as shown | 45.50 |
| Stand, with Large Cylinder, (filled, 450 gals. Gas) and 7-gal. Bag, complete as shown | 46.75 |

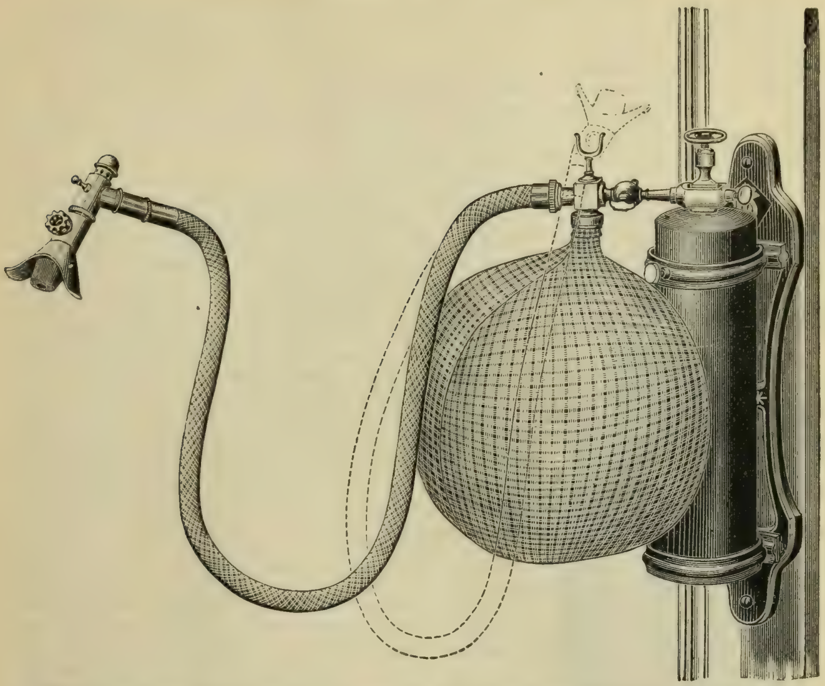
Inflatable Face-piece on the Inhaler is $4.00 extra; Flexible Face-piece $2.00 extra.

| | |
|---|---|
| Yoke Attachment, separately | $8.00 |
| Stand for Small Cylinder, separate (Boxing, 75 cents) | 4.50 |
| " " Large " " (Boxing, 75 cents) | 7.00 |

NOTE.—We do not furnish more than 450 gallons Nitrous Oxid Gas in our Large Cylinders.

# WALL-BRACKET FOR GAS CYLINDERS.

Patented April 27, 1886.



This is an excellent device for use in offices where the gas is administered frequently. The Bracket may be attached to the window-casing or other wood-work. The whole arrangement will be found compact and convenient.

PRICES.

| | |
|---|---|
| Complete as shown, with 4½-gallon Bag and Filled Cylinder | $30.50 |
| " " " 7 " " " | 31.75 |

Inflatable Face-piece on the Inhaler is $4.00 extra; Flexible Face-piece $2.00 extra.

Wall Cylinder Bracket, separate . . . . . . . $4.00

---

## RUBBER APRONS FOR DENTISTS.

Increase in Size—No Increase in Price.

To add to the efficiency of our Rubber Aprons, we have increased their length a quarter of a yard. They are now made 43 inches long and 34 inches wide at the middle line,—big enough to afford ample protection to the clothing, not big enough to interfere with freedom of movement. Can be put on and taken off almost instantaneously.

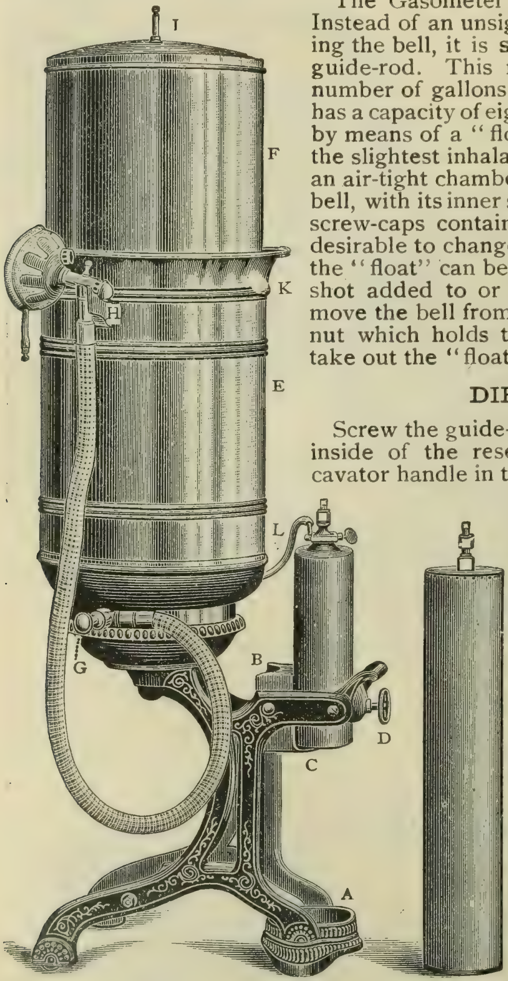
Made of rubber cloth, and nicely finished, with the edges bound.

Price . . . each 75 cents.

# NITROUS OXID GASOMETER.

## An Apparatus for Administration.

The complete apparatus consists of an iron stand (on rollers) for holding the cylinder and Gasometer, brass or copper reservoir or water-holder, with bell or gas receiver, guide-rod for same, 1 foot ¼-inch rubber tubing, No. 3 inhaler with inflatable face-piece and 4 feet covered tubing, metal connection for tubing, wood holder for inhaler, 2 Russia Iron jackets (one each for large and small gas cylinders), wheel key, and yoke.



The Gasometer is handsome in appearance. Instead of an unsightly gallows frame for guiding the bell, it is supplied with a nickel-plated guide-rod. This rod is marked to show the number of gallons of gas in the bell. The bell has a capacity of eight gallons. It is "balanced" by means of a "float," so that it will sink with the slightest inhalation of gas. The "float" is an air-tight chamber slid into the bottom of the bell, with its inner surface surmounted with two screw-caps containing gun-shot. Should it be desirable to change the "balance" of the bell, the "float" can be removed and the quantity of shot added to or decreased. To do this, remove the bell from the guide-rod, unscrew the nut which holds the "float" in position and take out the "float."

### DIRECTIONS.

Screw the guide-rod I into the bottom plate inside of the reservoir E, using say an excavator handle in the hole at the top of the rod to tighten it; attach the inhaler holder H. Put the bell F in position, making sure that the guide-rod enters the tube extending through the center. Open the valve G (it is a piston valve and is to be merely drawn out), and pour water into the tank, filling it to the bead K.

Close the valve G, attach the inhaler tubing to the valve, and set the gas cylinder, with its jacket adjusted, in the stand. Large cylinders are set in the socket A at the base of the stand, small ones on the ledge or flange C at one side of the reversible clamp B. After clamping the cylinder by means of the screw D, and adjusting the yoke, connect it by the rubber tubing L to the pipe at the bottom of the reservoir, and the Gasometer is ready for the admission of the gas.

The valve G is a cork plug, which of course is to be pulled out during the administration of gas. It is placed there to prevent the escape of gas through the valves of the inhaler when not in use.

PRICES.

| | |
|---|---|
| Gasometer complete, as above described . . . . . | $72.00 |
| The same, with 100-gallon cylinder and gas . . . . . | 78.00 |
| " " " 500 " " (about 450 gallons of gas say) | 90.00 |
| Boxing . . . . . . . . . . . . . . . | 2.00 |

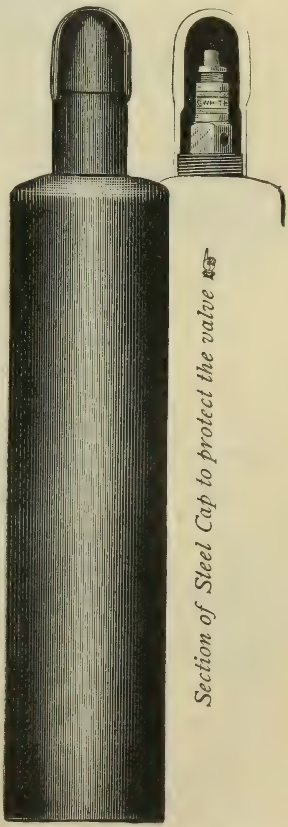
# OUR NEW

# SEAMLESS STEEL GAS CYLINDER.

Patented March 25, 1879.

These Cylinders are made without weld or seam, of a single piece of steel of a special formula, stipulated by us under the advice of engineers who make steel and its adaptations a specialty, its composition being so proportioned as to insure the metal against hardening to brittleness.

The inspection of the metal and all the processes of its manufacture have been under our direction.



The walls of these Cylinders are almost absolutely uniform in thickness, thereby securing the least possible weight compatible with strength adequate to meet the pressure required.

The Cylinders measure 4 inches outside diameter, by 17 inches long, clear of valve and neck, or 21½ inches long over cap and all, have a capacity for 250 gallons of liquefied nitrous oxid gas, or for 75 gallons of compressed oxygen, and have an average weight of 16 pounds without the cap, and 16¾ pounds with cap and valve complete.

It is evident that an appreciable saving in freight and express charges to out-of-town users would be accomplished by the use of this Cylinder, lighter in weight, stronger, and of greater storage capacity in proportion to the weight of metal.

These Cylinders will be found bearing our test of 3000 pounds per square inch, plainly stamped on the bottom.

We have carried our tests on a number of these to ascertain the strain required to rupture them by hydrostatic pressure, which has demonstrated the fact that it requires from 7000 to 8500 pounds per square inch.

These various tests are entirely convincing that the strength of the Cylinders is several times greater than any pressure they will be subjected to when filled with gas, and that the quality of the steel is the very best that can be procured for this purpose. We are sure that no high-pressure Cylinders were ever made as well adapted for the purpose as these which we now offer.

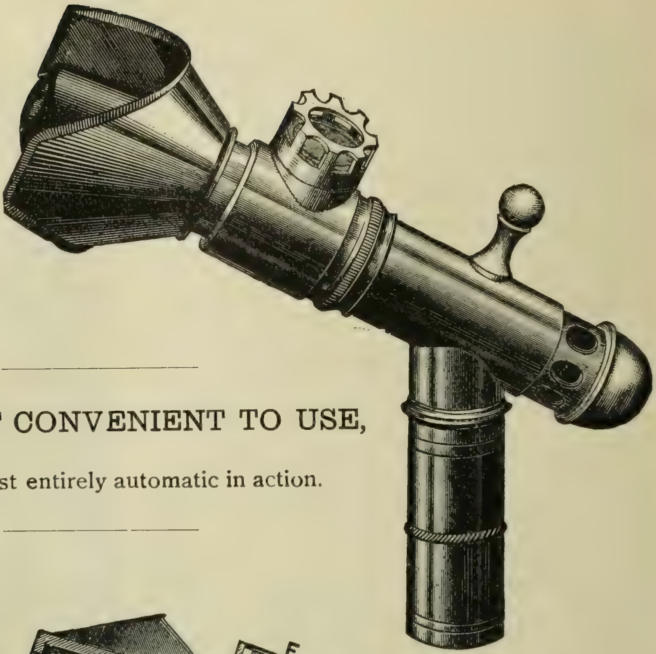
The illustration shows the cap covering the valve.

| | |
|---|---|
| Price . . . . . . . . . . . . | $10.00 |
| Refilling Cylinder with $N_2O$ Gas . . . . . . | 5.00 |

# Nitrous Oxid Inhaler, No. 3.

Patented Dec. 13, 1887; Feb. 14, 1888.

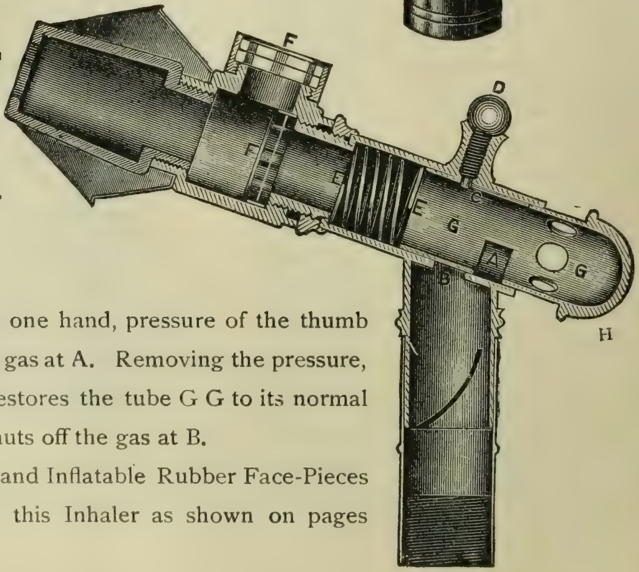
**The**
**Most**
**Perfect**
**Inhaler**
**made.**



THE MOST CONVENIENT TO USE,

Being almost entirely automatic in action.

**THE SECTIONAL**
**CUT**
**SHOWS THE**
**CONSTRUCTION.**



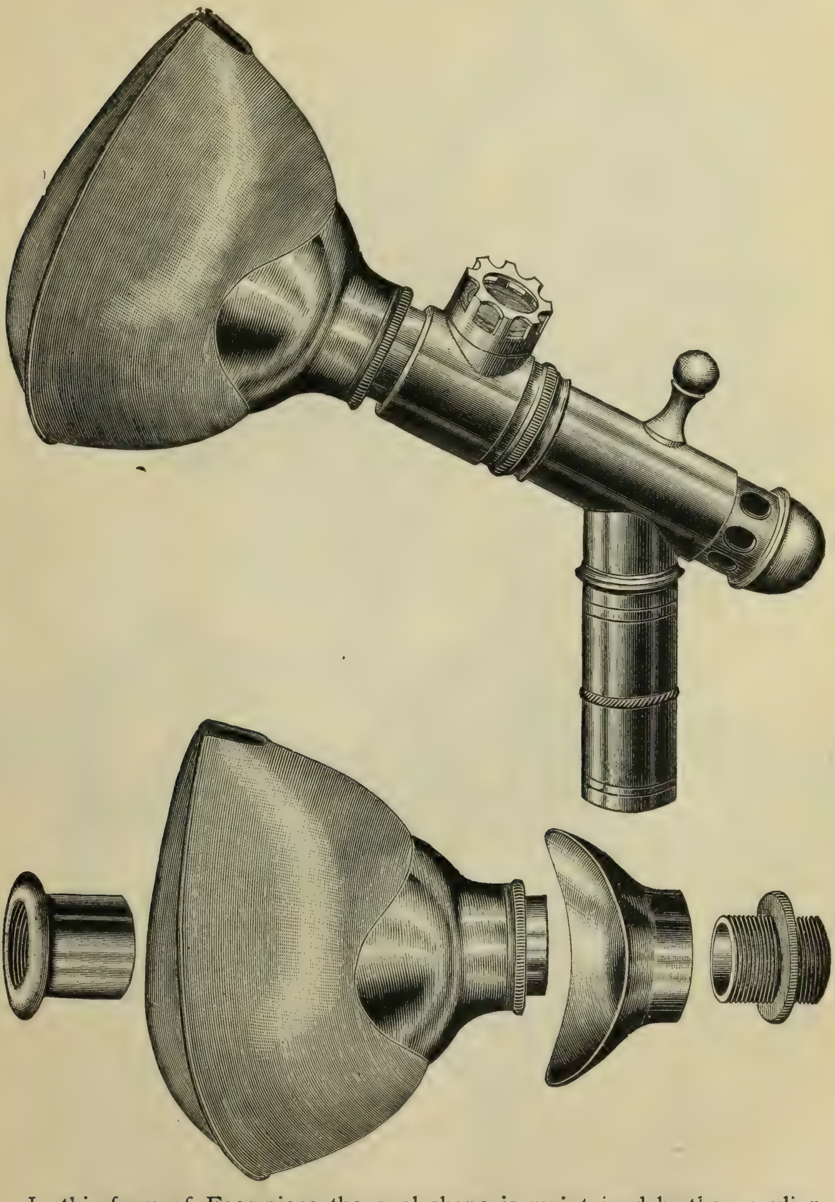
Holding it in one hand, pressure of the thumb at H admits the gas at A. Removing the pressure, the spring E restores the tube G G to its normal position, and shuts off the gas at B.

The Flexible and Inflatable Rubber Face-Pieces are adapted to this Inhaler as shown on pages 33, 34.

| Price . . . . . . . . . . | $8.00 |
|---|---|

# FLEXIBLE FACE-PIECE FOR INHALERS.

Inhaler patented December 13, 1887; February 14, 1888.



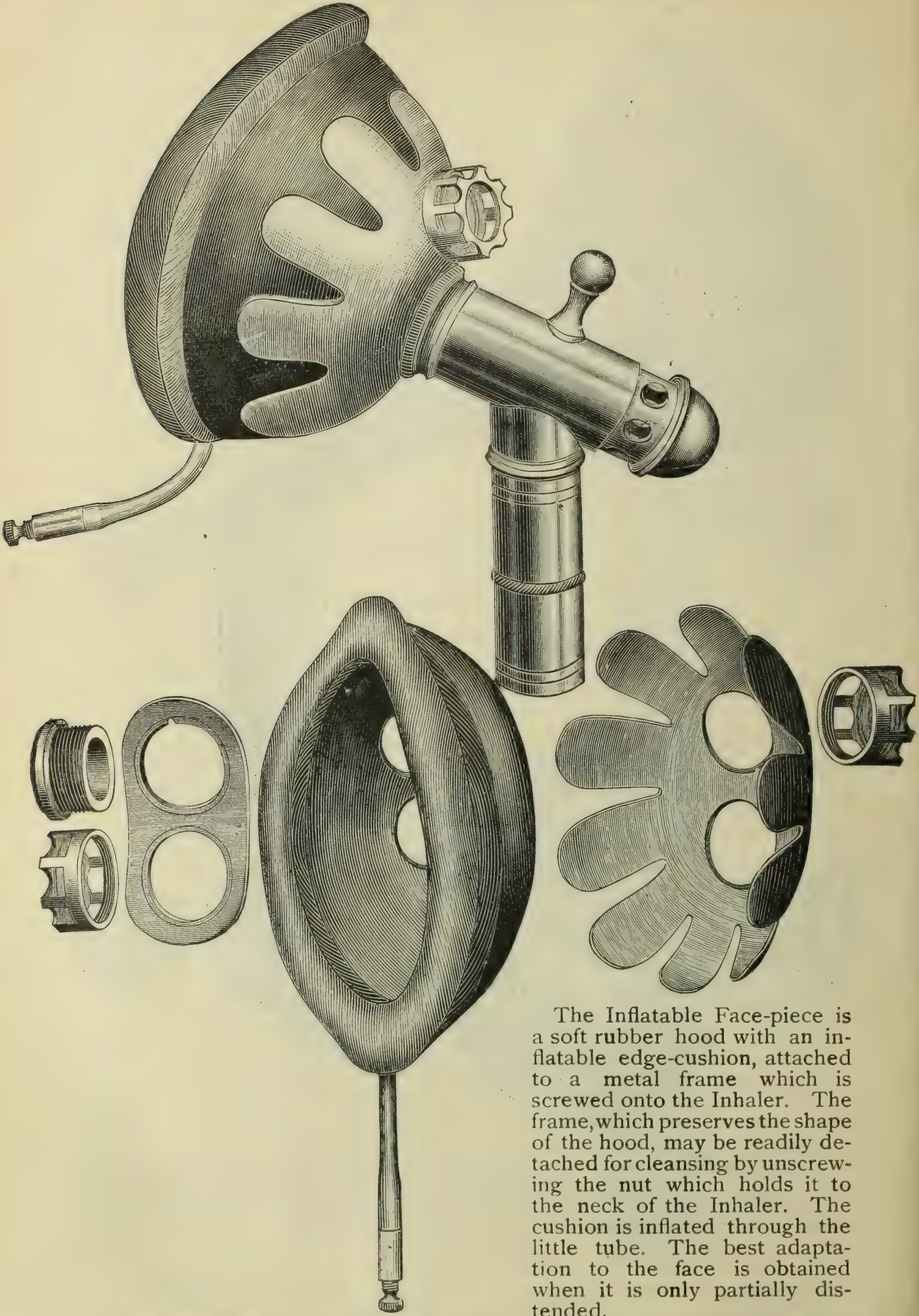
In this form of Face-piece the oval shape is maintained by the peculiar metal fittings, as shown in detail. It can be applied to the No. 1 or No. 3 Inhaler. In ordering, please state for which it is wanted.

## PRICES.

| | |
|---|---|
| Inhaler No. 3, with Face-piece and Fittings, Complete . . | $10.00 |
| Face-piece and Fittings . . . . . . . . . . | 3.00 |

# Inflatable Face-Piece for No. 3 Inhaler.

Inhaler patented December 13, 1887; February 14, 1888.



The Inflatable Face-piece is a soft rubber hood with an inflatable edge-cushion, attached to a metal frame which is screwed onto the Inhaler. The frame, which preserves the shape of the hood, may be readily detached for cleansing by unscrewing the nut which holds it to the neck of the Inhaler. The cushion is inflated through the little tube. The best adaptation to the face is obtained when it is only partially distended.

In adapting this improvement to the No. 3 Inhaler, we have found it desirable to place the exhaling valve of the Inhaler on the frame of the Face-piece.

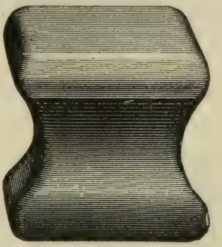
Price, Inhaler No. 3, with Inflatable Face-piece, Complete . $12.00
" of Inflatable Face-piece, with Shield, Washer, and Valve Caps necessary to adapt it to the No. 3 Inhaler } 6.75

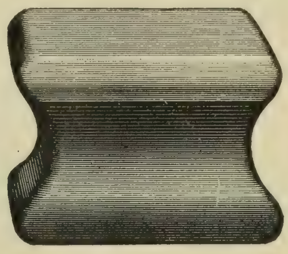
# SOFT RUBBER BITE-BLOCKS.

Patterns supplied by DR. S. H. GUILFORD.

The four Soft Rubber Bite-Blocks illustrated herewith, besides affording a variety of sizes sufficient to cover all requirements, have the following advantages:

1. Being elastic, they cannot injure the frailest tooth by being bitten upon.


1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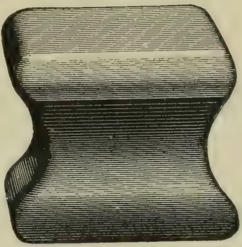
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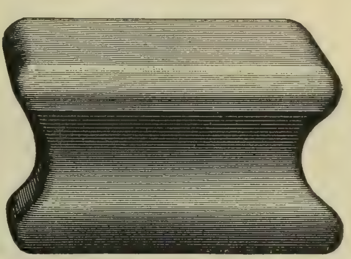
4

2. Their resilience will open the jaws if partially closed, as soon as muscular relaxation takes place.

3. Being grooved, they cannot fall into the mouth or be pressed out of place by the tongue.

4. They are too large to pass back into the pharynx or be swallowed, and they cannot be broken or injured by biting.

5. They do not need a string attached, and are readily removed.

6. Each block can be set at two heights, and can be placed at any point between the jaws without likelihood of slipping.

Price . . . . . . . . . . each 25 cents.

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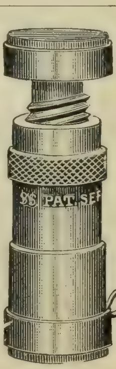
# Daintree's Adjustable Mouth-Prop.

Patented September 10, 1889.



This Mouth-Prop combines facility of lengthwise adjustment to suit the "open" of the jaws with a spring which affords the necessary elasticity. With the spring compressed the length at the shortest adjustment is $1\frac{3}{16}$ inches; at the longest, $1\frac{1}{2}$ inches. One head screws into the body, around which the other swivels, an elastic spring being confined between the swiveling head and the body. The heads are cushioned with cork, and there is a ring for the attachment of the retaining cord.

Price, Nickel-plated . . . . . . . $0.75

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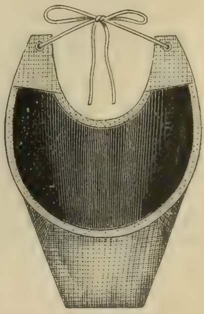
# Horton's Dental Apron or Bib.

Designed by R. HORTON, D.D.S.



The form of the Bib is plainly shown in the illustration. It is easily applied and readily removed. By its use the clothing is fairly protected, and soiled dresses and shirt-fronts avoided.

Made of checkered rubber cloth.

Price . . . . . . . . . $1.25

# The Bosworth Automatic Mallets.

## The Bosworth Direct-Action Mallet.

(Patented October 22, 1895.)

This is now perfected and ready for sale. It will be found convenient in form, light and easily adjustable to the heaviest or most delicate blow.

**The adjustment is made** by turning the milled screw at the end of the handle. Selections for this instrument may be made from our entire list of automatic points.

**The Case is our regular Mallet Case, with rack for twenty-four points.**

## The Bosworth Angle Mallet.

(Patented December 15, 1891, and June 21, 1892.)

With this Mallet the blow is struck at nearly a right angle with the plane of the handle, and the instrument is admirably adapted for packing all those cavities not easily reached with the direct blow.

## The Twelve Points shown

are furnished with each Angle Mallet, and these are thought to be sufficient for all requirements, but others will be supplied to order if desired.

Points Nos. 1 and 2 are burnishers.

## The force of the blow

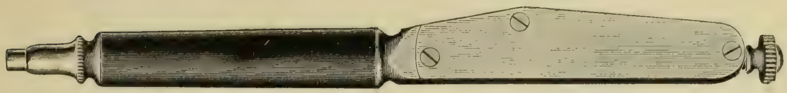
is regulated by the milled screw near the socket end.

| | |
|---|---|
| Price of Direct-Action Mallet . . . . . . . . | $7.00 |
| “ “ “ “ “ with Case . . . . . | 10.00 |
| “ “ Angle Mallet, with Case and Twelve Points . . | 16.00 |
| “ “ “ “ only with Points . . . . . . | 13.00 |
| “ “ Angle Points separately (per set) . . . . . | 3.00 |
| “ “ “ Case only . . . . . . . . . | 3.00 |

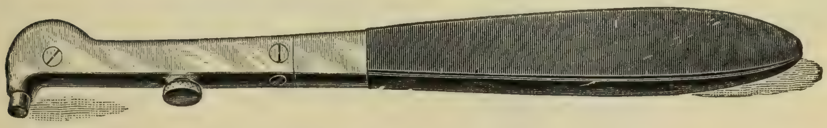
**THE S. S. WHITE DENTAL MFG. CO.,**

SOLE AGENT.

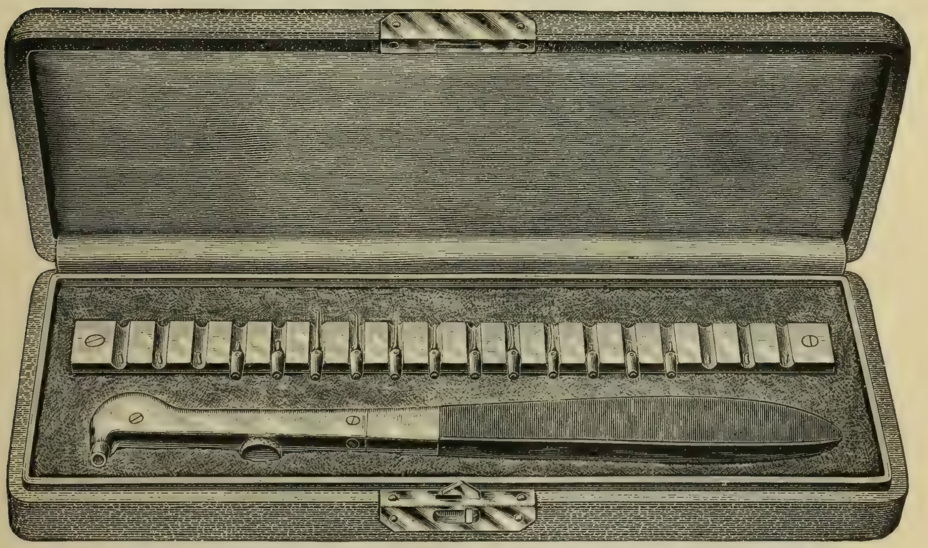
# THE BOSWORTH AUTOMATIC MALLETS.



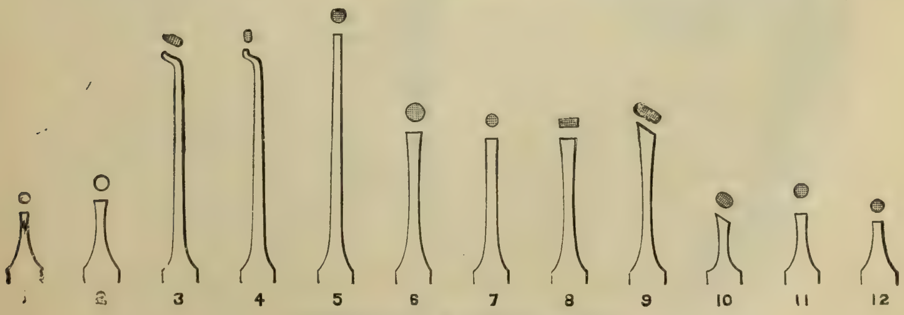
Direct-Action Mallet.



Angle Mallet.



Case for Angle Mallet and Points.

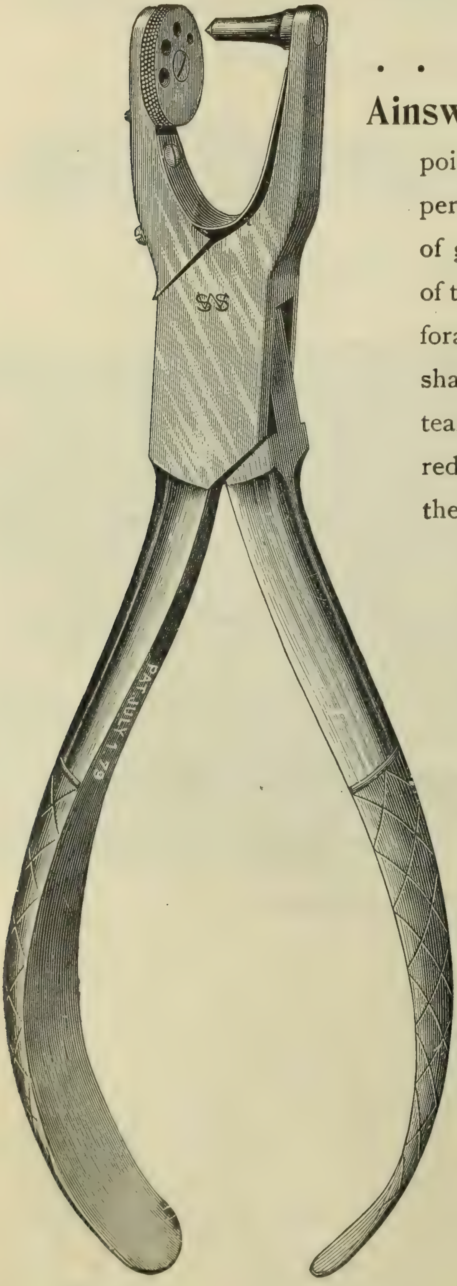


Points for Angle Mallet.

# AINSWORTH'S

# Improved Rubber=Dam Punch.

PATENTED JULY 1, 1879.



## . . In the . .

**Ainsworth Punch** a solid coned point cuts the rubber against a perforated die having four holes of graded sizes to fit the necks of the different teeth. The perforation is thus made clean and sharp, and the risk of the dam tearing during its adjustment reduced to the minimum. Both the point and the die are made of hardened steel, and the die is readily rotated to bring the desired hole in position.

**This well=known instrument has been improved by taking out the spring between the handles and placing it between the jaws, where it is equally effective and entirely out of the way of the hand.**

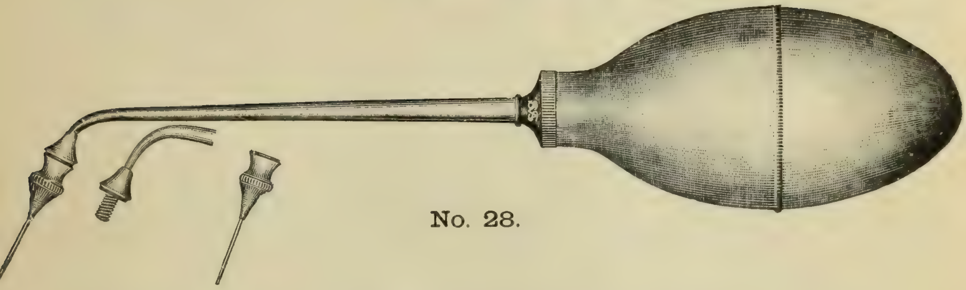
Made and finished in the style of our "Best" forceps and wedge-cutters.

**Price, Nickel=plated,**

**$3.50.**

# Bulb Abscess Syringe, No. 28.

Devised by Dr. C. F. KEIM.



No. 28.

This Syringe is quickly filled by first unscrewing the pipe. The absence of piston packing or valve precludes leakage, or the unequal pressure of common pistons. The gold pipe is thin enough to enter a pocket or sinus or the mouth of a pulp-canal.

The long tube carries the hand out of the way, while cotton or temporary stopping is packed in the cavity around the tooth, to insure the forcing of the fluid through the canal, abscess, and sinus. The cut is two-thirds full size.

Price . . . . . . . . each $1.50

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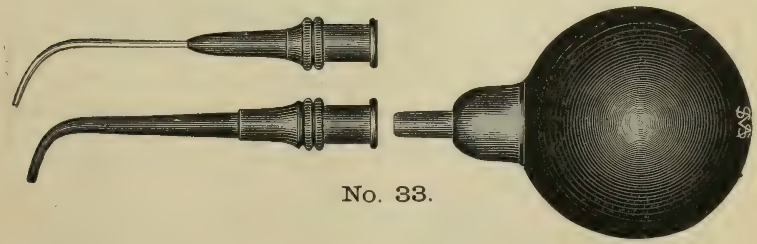
# The New Abscess Syringe, No. 33.



No. 33.

No. 33 is a more recent pattern of Syringe which has been very favorably received. The tubes are connected with the bulb by a slip-joint which facilitates changes. With the rubber tube it can be used as an ordinary Water Syringe, and changing this for the platinum tube it forms an excellent Abscess Syringe, not being affected by any medicaments used in the treatment of the teeth.

Price . . . . . . . . . $1.00

**We could use a long line of scientific phrases in describing . . .**

## DR. J. G. WILSON'S

# LOCAL ANESTHETIC,

**but we hardly think it necessary,** for it is recognized as the most reliable Anesthetic on the market.
Your money refunded if unsatisfactory.
A statement of the ingredients accompanies each bottle.
**One ounce, $1.00; two ounces, $2.00; ten ounces, $9.00.**
Order of your dealer.

**CENTRAL CHEMICAL CO.,**
**Wellsville, N. Y.**

THE BEST ANTISEPTIC.

# LISTERINE.

Invaluable to the Dental Practitioner.
Indispensable for the Dental Toilet.

To Cleanse and Deodorize before Operating.
To Wash and Purify the Mouth after Extracting.
To Treat Antiseptically all Diseases of the Oral Cavity.
To Prescribe as a Detergent Prophylactic Mouth-wash.

Listerine is a perfect tooth and mouth-wash, and has received the Highest Recognition as the Best General Antiseptic for a

DENTIST'S PRESCRIPTION.

☞ We shall be pleased to send you our new and complete pamphlet of 40 quarto pages, embodying full and exhaustive reports of the Antiseptic value and utility of Listerine.

**LAMBERT PHARMACAL CO.,**
ST. LOUIS, MO., U. S.

British, French, German, Spanish, and Canadian Trade constantly supplied.

---

# OAKLAND HYDROGEN DIOXIDE, U. S. P.

is an official solution of $H_2O_2$, of definite strength and uniformity, free from excessive acidity, and will keep at ordinary temperatures from four to six months uncorked. Highly concentrated solutions, 25% or stronger, can be made in a saucer or porcelain evaporating dish by slowly evaporating a given quantity at not above 175° F. over a sand bath. Any gentle heat that will not agitate the solution will suffice. As the quantity decreases the strength increases. Thus, four ounces of a three per cent. solution evaporated to one ounce gives practically 12%, and eight ounces reduced to one ounce gives a product of 24%, etc. The solution is free from dangerous pressure, and will keep from four to six months after being uncorked. Pound bottles retail at 75 cents.

**THE OAKLAND CHEMICAL CO.,**

89 and 91 South Fifth Avenue, New York.

Sample, and monograph containing full instructions for use, free on receipt of 15 cents to prepay express charges.

# PYORRHEA ALVEOLARIS.

**WHAT IS PYORRHEA ALVEOLARIS?**

A more or less general formation of pus about the roots of the teeth exuding from beneath the free edges of the gums.

**WHAT IS ITS CAUSE?**

Systemic predisposition, combined with decided induration of tooth-tissue or other local irritant (sanguinary calculus, caries or necrosis of process edge, gum pouches).

**WHAT IS ITS TREATMENT?**

If possible, thorough removal of all local possibilities for irritation, together with astringent, detergent and stimulant medication (zinc chloride, zinc iodide, carbolic acid and caustic potassa, dilute sulphuric acid, peroxide of hydrogen).

**WHAT IS THE PROGNOSIS?**

*Possible* amelioration of greater or less duration; *probable* recurrence of trouble, with usually gradual but persistent re-establishment of previous condition.

*Flagg & Inglis "Dental Pathology and Therapeutics."*

---

**The use of Seabury's saturated solution of WHITE OAK BARK will absolutely prevent a recurrence or re-establishment of pyorrhea alveolaris.**

**It is a standard preparation, and may be used as a GARGLE full strength, without any ill effects.**

| | | | |
|---|---|---|---|
| 12-oz. bottle, price | $1.00; | per dozen | $8.00 |
| 6-oz. " " | .50; | " " | 4.00 |
| 2-gallon jug, price per jug | | | 8.00 |

TRADE SUPPLIED BY

**THE S. S. WHITE DENTAL MFG. CO.**

---

# SPYER'S ADHESIVE PLATE.

(Patent Applied For.)

## FOR UPPER AND LOWER DENTURES.

### Air-Chamber Not Necessary.

Inventor of the Automatic Suction Cavity. Inventor of the Soft Rubber Dental "Blanks."

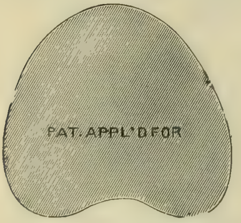


Fig 1. Spyer's Adhesive Plate for Upper Dentures.

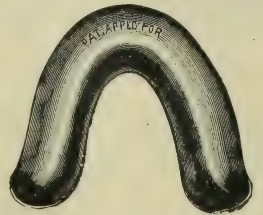


Fig. 2. Spyer's Adhesive Plate for Lower Dentures.

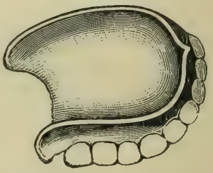


Fig. 3. Finished Denture with Adhesive Plate.

The principal advantages in the use of Spyer's Adhesive Plate are:

The method of using is simple in the extreme, and readily learned by any dentist from the plain directions which accompany each box.

The denture adheres firmly in any mouth, hard or soft, deep or flat.

It imparts a soothing sensation to the gums and mucous membrane, prevents irritation, and keeps the mouth in a healthy condition.

The close adhesion of the denture prevents the ingress of food particles between the plate and gums.

Mastication is performed with ease and comfort because the plate is not displaced during the process.

Old dentures can be readily fitted with the Adhesive Plate by following the directions.

After once using the Adhesive Plates you will always want them.

$1.00 a Box, each box containing six, put up as follows: No. 1, containing 3 upper and 3 lower; No. 2, containing 6 upper; No. 3, containing 6 lower.

Many unsolicited testimonials received, of which the following is an example:

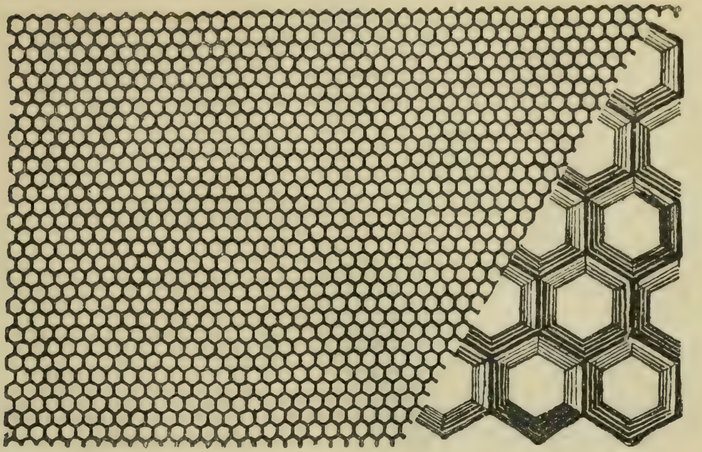
"Inclosed find check for $1.00, for which send me by return mail one box of your Adhesive Plates. Used them in mouth that would not hold an ordinary rubber plate at all. Now, with your Adhesive Plate, patient wears teeth with comfort."—O. E. MICKEL, *Haverhill, Mass.*

Can be had at all dental depots, and of the inventor and manufacturer.

JOSEPH SPYER, D.D.S.,
182 Broadway, New York City.

# COMBINATION DENTURES.

Invented by Dr. R. WÜNSCHE, Annaburg, Germany.



**The weight of Rubber reduced one-half.**

**The strength of the Base Plate doubled.**

**Impossible for the Metal to separate from the Rubber.**

---

**The Cut shows the full size . . .** of the metal plate. Part of the illustration on the right shows the perforations as they appear under a strong magnifier.

**The holes are countersunk . . .** so that the rubber forced through them forms a head or clinch on the face of the plate, making it impossible to detach them by any ordinary force.

**Using these re-inforcing plates . . .** your patients will be grateful for the light, thin dentures you will give them, and you will be saved the annoyance of having to repair broken plates. The metal plates readily take the form of the cast, giving but the slightest trouble in fitting.

**Each box contains full directions, with illustrations of their application.**

---

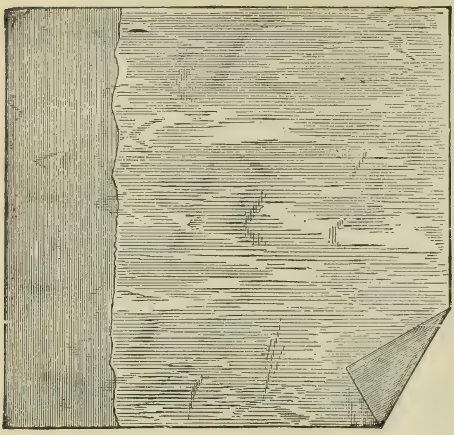
PRICES.

| | | |
|---|---|---|
| No. 1, Aluminum Plates . . . . . | each | $0.35 |
| | per box of six | 2.00 |
| No. 2, Victoria Metal Plates (gold colored) | each | .60 |
| | per box of six | 3.50 |

# THE VULCAN GOLD LINING.

A Perfect Gold Covering for Rubber Plates.

Patented Oct. 22, 1889.



The Gold is applied in one piece to the surface to be covered.

No extra care is required in packing the flask.

This Lining is composed of pure Gold with a thin covering of pure Silver.

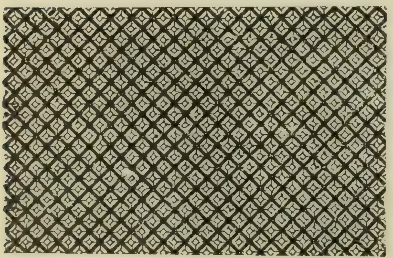
The union between the rubber plate and the Gold Lining is mechanical; the sulphur in the rubber set free in vulcanizing corrodes the surface of the Silver, to which the rubber adheres perfectly. The sheets are of the thickness of No. 20 foil, and each book contains about forty-eight (48) square inches,—enough to cover six plates on one side, or four on both sides. Having received requests for a heavier lining, we will supply it of the thickness of No. 40,—the books containing half the number of square inches of the No. 20.

If the rubber plate is covered on both sides it is tougher when vulcanized, as the pressure against the metal gives the plate a surface more dense than it will have if vulcanized in contact with plaster.

Price . . . . . . . . . . per package $5.00

---

# Dr. Wünsche's Metal Adhesion Plates.



These plates are of very strong white metal, enabling the dentist to dispense with the vacuum-chamber in upper dentures, besides adding very much to the strength of the case.

The cut imperfectly represents the cup-like depressions, each one of which constitutes a perfect vacuum-chamber. The plate may be cut to any form, and used on any part of the base-plate as may be desired.

The material is sufficiently hard to prevent the flattening of the convexities under any necessary pressure.

Each box will contain full directions.

Price . . . . . . . . . . each 5 cents.
" . . . . . . . per box of six 25 "

---

# Crown- and Bridge-Work Instruction.

The undersigned is prepared to give thorough instruction to dentists desiring to perfect themselves in practical crown- and bridge-work.

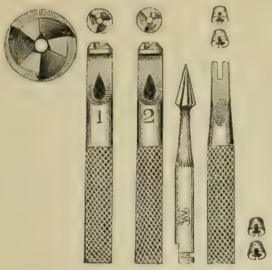
Realizing a demand for well-made show-pieces of bridge-work, I can supply the profession with the same in any form from single crowns to full-mounted models, also plate-work of all kinds.

For particulars and prices address

H. W. NORTHROP, D.D.S.,
510 Fifth Ave., New York City.

# BRIDGE-REPAIR TOOLS.

Invention of Dr. E. A. Bryant.



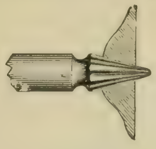


Fig. A.

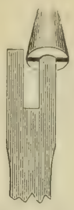


Fig. B.

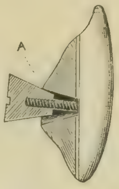


Fig. C.

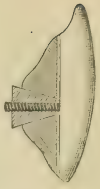


Fig. D.

Each pin of the selected tooth-facing is to be screw-threaded with Die No. 1, first oiling the pin and finishing it with Die No. 2. The pin-holes in the bridge backing are countersunk from the rear with the right-angle engine Reamer No. 3 (see Fig. A). With the Nut-driver No. 4, one of the Gold Nuts No. 5 is caught on one prong (see Fig. B), and started on one of the pins (see Fig. C), and then the other nut is likewise started. Turning one after the other, the nuts are screwed tightly on, and then with engine points the projecting pins and nuts (see Fig. D) are ground flush with the backing. For further details see Dr. Bryant's description in the Dental Cosmos for June, 1894, page 470.

The numbered cuts show the exact sizes of the tools, which (except No. 3) are operated with thumb and forefinger without overdue force on pin or nut. The illustrations A, B, C, D are enlarged views.

Reamer No. 3 is kept in stock to fit all Right Angles.

PRICES.

| | |
|---|---|
| Tooth-pin Dies, Nos. 1 and 2 . . . . . . | each 75 cents. |
| Right-Angle Reamers, No. 3 . . . . . . | " 25 " |
| Nut-Drivers, No. 4 . . . . . . . | " 25 " |
| Gold Nuts, No. 5 . . . . . . . . . | " 50 " |
| The Set in box containing one each of Nos. 1, 2, 3, 4, and two of No. 5 . . . . . . . . . | $3.00 |

When ordering, state for which style of Right Angle No. 3 is wanted.

# Surface-Cohesion Forms for Artificial Dentures.

Invention of Dr. Joseph Spyer. Patented Jan. 6, 1885; Dec. 8, 1885.

Fig. 1.

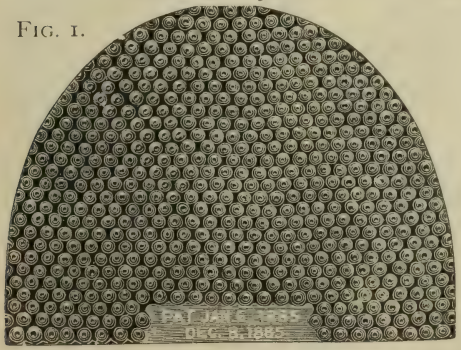
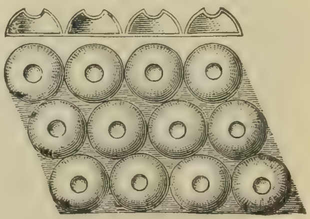


Fig. 2.



A thin metallic Form, the surface covered with minute prominences—shown in Fig. 2 magnified—which by displacement of mucus at the points of gum contact effect cohesion as if the denture were glued to the gums, yet cause no irritation and leave no marked indentations. Adapted for either upper or lower plates. By the aid of this device strong cohesion can be had with a narrow plate, and thus the sense of taste be left unimpaired. Put up in packages containing one dozen Forms size of Fig. 1, which can be cut for either upper or lower plates. Full directions accompany each package.

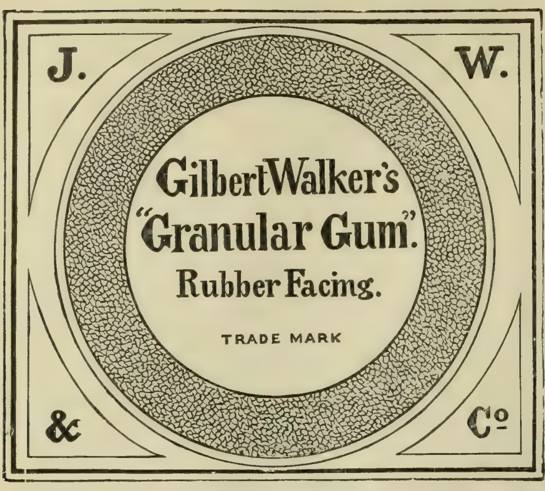
| | |
|---|---|
| Price . . . per box containing one dozen Forms | 25 cents. |
| Rubber Cement . . . . . . . . | per bottle 25 " |

These Forms are also made of gold with a thin lining of Silver, similar to our Vulcan Gold Lining, and for like use. Thickness of No. 120 Foil.

| | |
|---|---|
| Price . . . . . . . . . . . . | each $2.50 |

# Dr. Gilbert Walker's
# Vulcanizable "Granular Gum" Facing.

Patented January 1, 1889.



A decided improvement upon the solid color of pink rubbers for facings. When vulcanized, polished, and wetted (as by the saliva), it approximates the appearance of the well-known continuous-gum work, and the dentist can either match the natural gum adjoining the artificial gum of the partial denture, or suit the color of a full denture to the complexion of the patient.

"Granular Gum" vulcanizes with any dental rubber, and a very thin facing is sufficient. Wrapped in tin foil and put up in envelopes containing one ounce, which will serve for four full sets. Directions with each package.

PRICES.

| | | Per oz. |
|---|---|---|
| No. 1. | Mottled Granular Gum . . . . . . | $1.00 |
| No. 2. | Purple Tint Dark Granular Gum . . . . . | $1.15 |
| No. 2A. | " " Light " " . . . . . | |
| No. 3. | Florid " Dark " " . . . . . | |
| No. 3A. | " " Light " " . . . . . | |

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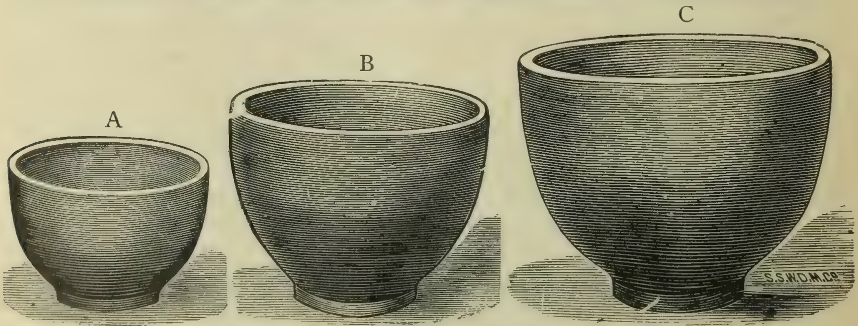
# RUBBER BOWLS FOR MIXING PLASTER.



These Bowls are made of soft vulcanized rubber thick enough to give all the strength and rigidity required. They cannot be broken; their sides can be pressed together to form a lip or spout for pouring thin-mixed plaster; and any unused plaster which sets in them can be crushed and removed by squeezing the sides of the Bowls together.

The Rubber Plaster Bowls have made for themselves a place in almost every dental laboratory.

They are designated as A, B, C,—A smallest, B medium, and C the largest. The dimensions are: A, 3¼ inches in diameter at the top by 2¼ inches in depth; B, 4 inches in diameter by 2¾ inches in depth; and C, 4½ inches in diameter by 3½ inches in depth.

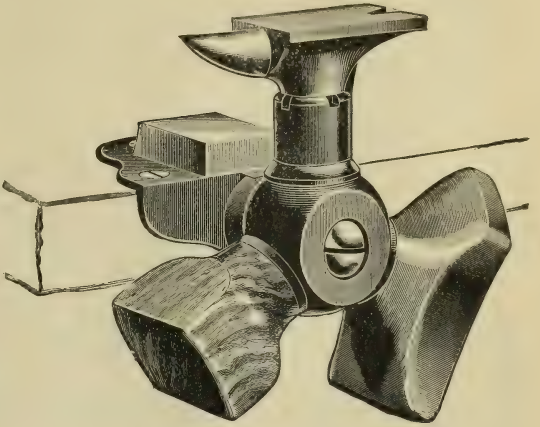
PRICES.

| | | |
|---|---|---|
| Rubber Plaster Bowl, A . . . . . . . . | each | $0.50 |
| " " " B . . . . . . . . | " | .60 |
| " " " C . . . . . . . . | " | .80 |

# Revolving Combination Anvil and Bench Block.

Devised by G. W. Melotte, M.D.S.

Patented Sept. 13, 1892.



This combination Tool consists of a hub carrying a case-hardened steel anvil, a par-vulcanized rubber block and a wood block for filing, mounted on a bracket to be fastened to the work-bench. It is adjusted by pulling out the hub slightly, revolving it until the proper appliance is in position, then releasing, when it is held firmly as placed by a friction-clutch. The bracket also affords a hammering surface.

Price, complete . . . . . . . . . . $3.00

DUPLICATE PARTS.

| | | | |
|---|---|---|---|
| Brackets . . . | each $0.50 | Rubber Blocks . | each $0.35 |
| Anvils . . . | " 1.00 | Wood . . . | " .15 |

**The S. S. White Dental Manufacturing Company,**

Sole Agent for the dental trade for all countries except the United Kingdom of Great Britain and Ireland.

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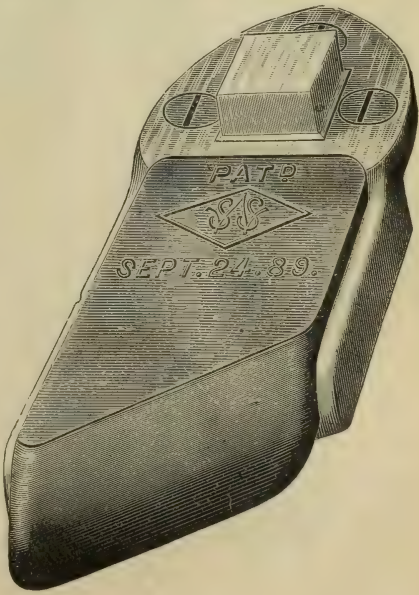
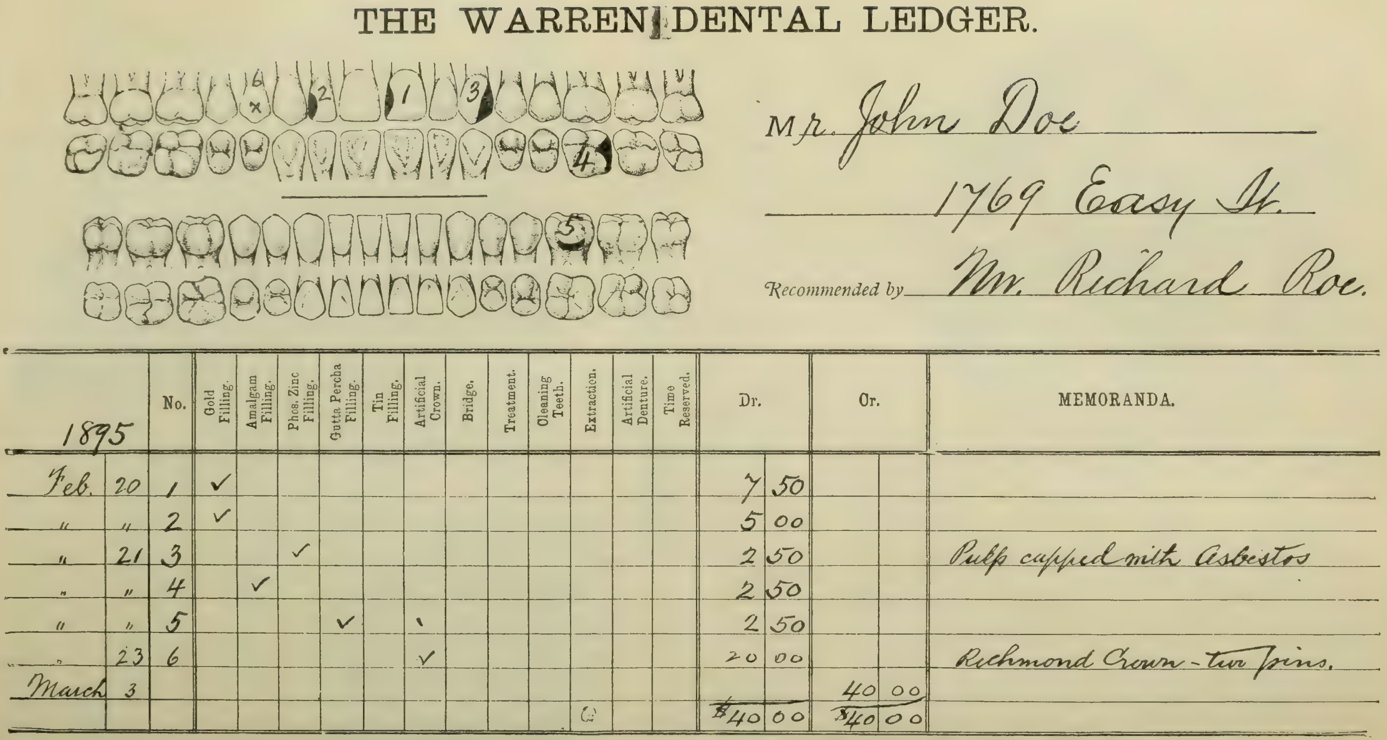
# BENCH BLOCK.

Patented September 24, 1889, by Dr. E. R. Magnus.



As a file-block, soft rubber has no superior, if indeed it has a rival. The frame of this Block is made of cast iron (gray nickel finish) surmounted by a chilled face anvil. The Block is par-vulcanized rubber. The frame can be fastened to the laboratory bench by the three screws which accompany it. The rubber blocks can be replaced when worn. There are two sizes. The large size is 3 inches long by 1⅞ inches wide; the small size 3 inches long by 1¼ inches wide.

Price, either size . each $1.25
Rubber Blocks, separately .35



THE WARREN DENTAL LEDGER.

Mr. John Doe

1769 Easy St.

Recommended by Mr. Richard Roe.

| 1895 | | No. | Gold Filling. | Amalgam Filling. | Phos. Zinc Filling. | Gutta Percha Filling. | Tin Filling. | Artificial Crown. | Bridge. | Treatment. | Cleaning Teeth. | Extraction. | Artificial Denture. | Time Reserved. | Dr. | Cr. | MEMORANDA. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb. | 20 | 1 | ✓ | | | | | | | | | | | | 7 50 | | |
| " | " | 2 | ✓ | | | | | | | | | | | | 5 00 | | |
| " | 21 | 3 | | | ✓ | | | | | | | | | | 2 50 | | Pulp capped with Asbestos |
| " | " | 4 | | ✓ | | | | | | | | | | | 2 50 | | |
| " | " | 5 | | | | ✓ | | | | | | | | | 2 50 | | |
| " | 23 | 6 | | | | | | ✓ | | | | | | | 20 00 | | Richmond Crown - two pins. |
| March | 3 | | | | | | | | | | | | | | | 40 00 | |
| | | | | | | | | | | | | | | | $40 00 | $40 00 | |

Reduced Fac-Simile, illustrating Method of Keeping Accounts.

[For description, see next page.]

# Dentists' Pocket Diary and Appointment Book,

FOR

## REGISTERING APPOINTMENTS FOR DENTAL OPERATIONS.

**MONDAY.** 18

| | | | |
|---|---|---|---|
| 8 | | 1 | |
| | | | |
| 9 | | 2 | |
| | | | |
| 10 | | 3 | |
| | | | |
| 11 | | 4 | |
| | | | |
| 12 | | 5 | |
| | | | |

**TUESDAY.**

| | | | |
|---|---|---|---|
| 8 | | 1 | |
| | | | |
| 9 | | 2 | |
| | | | |
| 10 | | 3 | |
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| 11 | | 4 | |
| | | | |
| 12 | | 5 | |
| | | | |

**WEDNESDAY.**

| | | | |
|---|---|---|---|
| 8 | | 1 | |
| | | | |
| 9 | | 2 | |
| | | | |
| 10 | | 3 | |
| | | | |
| 11 | | 4 | |
| | | | |
| 12 | | 5 | |
| | | | |

The above Diagram shows the exact size and style of a page of the Pocket Diary, presenting, when open, engagements for one week. The figures denote the hour of the engagement. It contains blanks for 54 weeks, and, being without date, is good for any time. It has also a neat memorandum attached.

| | |
|---|---|
| Flexible Cover, Gilt Edge . . . . . . . . | $0.75 |
| " " " " with Pocket and Tuck . . . | 1.00 |

## THE MEREDITH
# POCKET DENTAL ACCOUNT BOOKS.

Being carried in the pocket, the Meredith Pocket Dental Account Books are always at hand when wanted for recording an appointment or operation. The various books of the series are very nicely adapted for their particular use. The space is economically used. Operations on the temporary teeth may be recorded without danger of mistake, and each operation having a space and diagram of its own cannot be mistaken for one performed at some other time.

There are three books in the series:

### The Pocket Dental Register and Appointment Book

contains 224 pages, divided as follows: 120 pages for small accounts, ten to the page, each supplied with a diagram for locating operations; 24 pages for medium accounts, two to the page; 16 pages for larger accounts, one to the page; 16 pages with ten accounts to the page for operations on the temporary teeth; 32 pages for appointments, twelve days to the page (sixty-four weeks), good for any time; and 16 pages for memoranda.

For dentists of small practice this book supplies all the requirements.

### The Pocket Dental Journal and Appointment Book,

Designed for use as the day-book and journal of the merchant, for recording the operations of the day as they are completed, which are afterward to be posted to a ledger. There are 176 pages with ten blanks to the page; 8 pages for operations on temporary teeth; 32 pages for appointments, and 8 pages for memoranda. It may be used in connection with any of our dental ledgers, or with

### The Pocket Dental Ledger and Appointment Book,

Made up principally of the large and medium blanks used in the Register, and therefore to be used more especially as a Ledger or condensed statement of the work recorded in the "Journal." It has 96 pages for medium accounts, two to the page; 72 pages for large accounts, one to the page; 8 pages for operations on temporary teeth; 32 pages for appointments; and an ample index and pages for memoranda.

Prices uniform for all the above.

| | |
|---|---|
| Cloth . . . . . . . . . . . | $1.25 |
| Leather, with Tuck . . . . . . . . | 1.50 |

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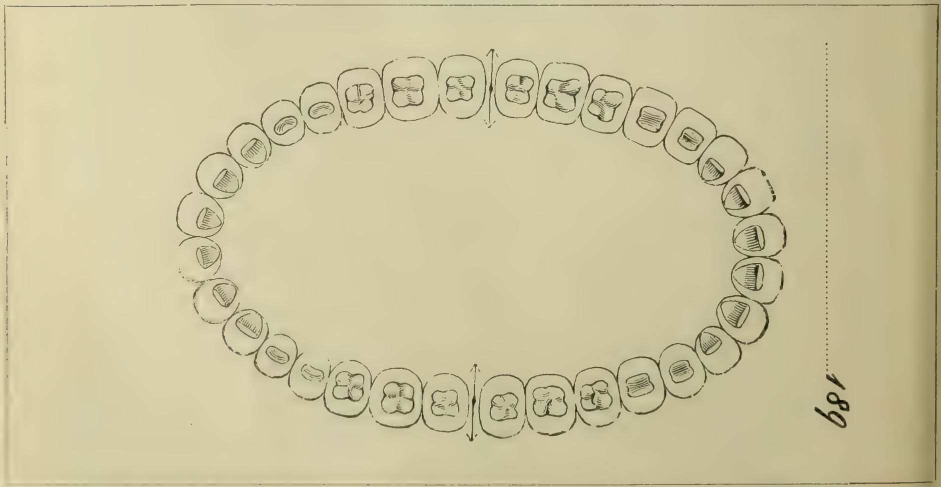
## MEMORANDUM BLANKS.



The size and style are shown by the diagram. Plain backs. 100 in a tablet.

Price . . . . . . . . per tablet 20 cents.

## GRIFFITH'S

# Appointment Book and Emergency Compendium.

By J. F. GRIFFITH, D.D.S.

Dr. Griffith offers a new and convenient form of Appointment Book, to which is appended a collection of useful hints bearing on emergencies, and information on general practice not at every dentist's finger-ends.

In the Appointment pages, of which there are sufficient for fifty-five weeks, the left-hand page as the book is opened is for appointments, three days with ample space for eight appointments to the day, being arranged for on each. The opposite page is for memoranda. The hours of forenoon and afternoon appointments are entered in separate columns.

The book is neatly bound in leather, with aluminum stamp and gilt edges. Two styles, plain, and with fold-over flap, pocket, and pencil-holder. Made for pocket, of course.

PRICES.

| | |
|---|---|
| Leather, plain | $1.00 |
| Leather, with flap, pocket, and pencil-holder | 1.25 |

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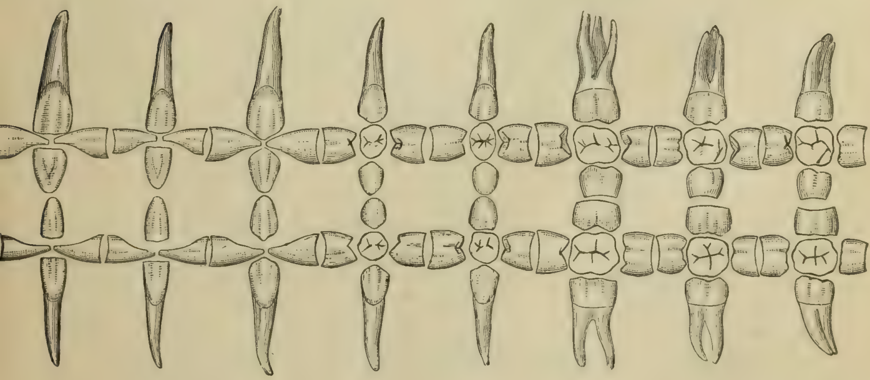
# AINSWORTH'S DENTAL LEDGER.

Devised by DR. GEO. C. AINSWORTH.



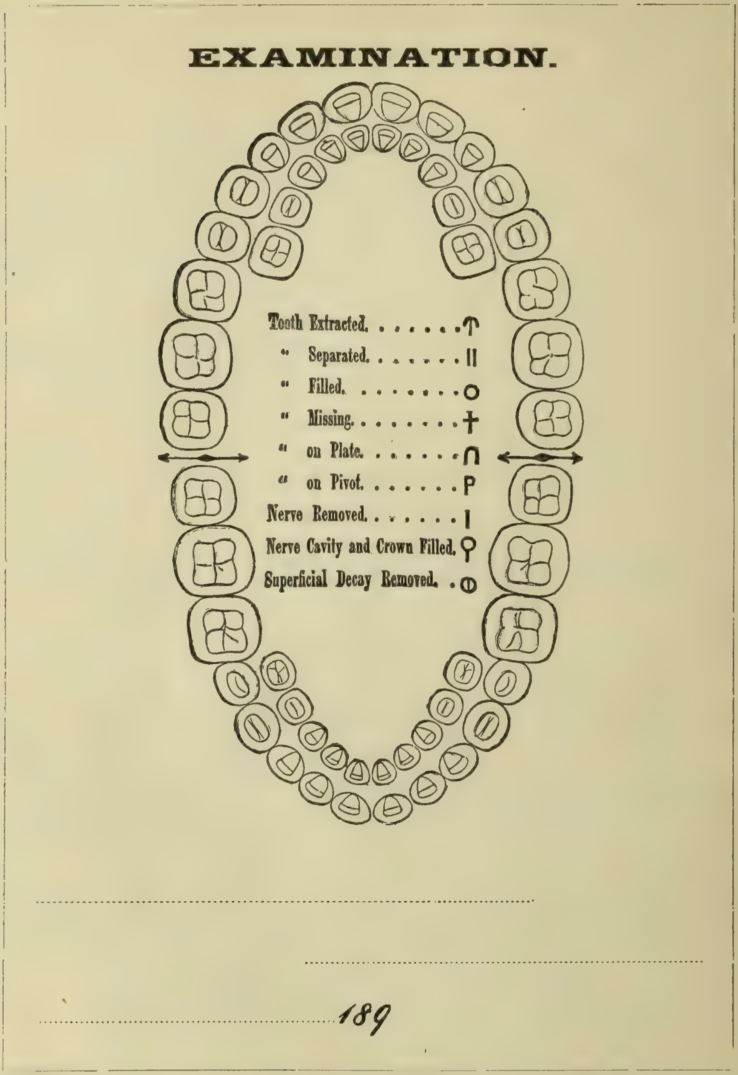
The diagram which Dr. Ainsworth uses (of which one side—the left—is shown) permits an operation on any portion of any crown to be so plainly indicated that there can be no mistaking its exact location. The pages are 9¼ x 11½ inches, made up into books of 200 and 396 pages. The smaller books are bound in half Russia, cloth sides; the larger are full bound, with Russia corners—regular ledger binding.

A proportionate number of the pages in each style is ruled for one, two, and three accounts to the page, each account having a separate diagram. The index is interleaved with blotter.

PRICES.

| | |
|---|---|
| Half Russia, 200 pp. | $3.50 |
| Full Bound, 396 pp. | 6.50 |

# EXAMINATION BLANKS.



## EXAMINATION.

| | |
|---|---|
| Tooth Extracted | ↑ |
| " Separated | ‖ |
| " Filled | ○ |
| " Missing | † |
| " on Plate | ∩ |
| " on Pivot | P |
| Nerve Removed | \| |
| Nerve Cavity and Crown Filled | ♀ |
| Superficial Decay Removed | Φ |

.....................................................................

.....................................................................

..................................................................189

The reverse side of these Examination Blanks is prepared for memorandum accounts. Size 5⅜ x 3¾ inches. Put up in tablets of 50 each.

Price . . . . . . . . . . per tablet 20 cents.

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# DENTISTS' BILL-HEADS.

### PUT UP IN TABLETS OF 100.

PRICES.

| | |
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| No. 1 . . . . . . . . . . | per hundred 60 cents. |
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# UNIVERSITY OF MICHIGAN.

## COLLEGE OF DENTAL SURGERY.

The 21st annual session begins October 1, 1895, and closes June 27, 1896.

The preliminary examination will be held Monday, September 30, 1895.

Three full courses of study of nine months each are required for graduation.

The fees, which must be paid in advance each year, are for non-residents of Michigan, $65 first year, $40 second year, and $50 third year. These fees cover all expenses of tuition, but not of materials used in laboratory courses.

The annual announcement containing full particulars will be sent to any one addressing a request to J. TAFT, Dean, Ann Arbor, Mich.

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We are also manufacturing COHESIVE FINE GOLD FOIL, Nos. 4, 5, and 6.

ALL our Gold Foil is manufactured from ABSOLUTELY PURE GOLD, prepared expressly for the purpose, with great care, by ourselves.

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Twenty years established in British Guiana; clientele of the highest class. Yearly receipts over $7000, without an assistant. With the right party liberal terms will be arranged, but none need apply who do not mean business or have no cash. For particulars, address "GUIANA,"
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## Temporary Position as Operator Wanted.

A graduate dentist, engaged in a partnership practice in an inland summer resort, wishes to obtain employment for January, February, and March next in a reputable dental office in New York, Boston, or Philadelphia. The number of his appointments being comparatively small during these months his practice can easily be left in charge of his partner, and he is willing to work for a nominal salary in order to enjoy the educational advantages of a large city. He is thirty-one years of age, with eight years' experience as an operator and crown- and bridge-worker. Good references given. Address
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## WANTED,

A partner in one of the most select dental practices in the city of Mexico. Must be an experienced all-around dentist as well as bridge-worker; of good address and well recommended. A knowledge of either the Spanish, French, or German language would be of great help. This is an extraordinary chance for an ambitious and able man to work himself into a firmly established, well-paying practice of the highest standing in this capital. Price for half interest, $3000. All particulars furnished on application. Address "MEXICO,"
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# DENTAL DEPARTMENT

OF THE

# Marion-Sims College of Medicine,

COR. GRAND AVE. AND CAROLINE STREET,
ST. LOUIS, MO.

The Session of 1895-96 begins September 24, 1895, and ends April 24, 1896.
Three full courses of study are required before graduation.

**FEES FOR THE ENTIRE TERM ARE $85.00.**

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C. C. COWDERY, D.M.D., Professor of Dental Materia Medica and Therapeutics.
P. F. HELLMUTH, A.M., M.D., D.D.S., Professor of Dental Pathology and Orthodontia.
J. C. CHISHOLM, Professor of Crown- and Bridge-Work.
J. P. HARPER, Professor of Operative Technics.
W. L. WHIPPLE, Professor of Dental Anatomy.
JACOB GEIGER, M.D., Professor of Surgery.
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O. E. TREUTLER, Ph.G., M.D., Professor of Chemistry and Materia Medica.
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T. C. WITHERSPOON, M.D., Professor of Physiology.
LOUIS CRUSIUS, M.D., Professor of Histology.
GEO. TANSEY, B.L., Professor of Dental and Medical Jurisprudence.
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E. H. SPOONER, M.D., Lecturer on Physics.

For further information and announcement, address

**J. H. KENNERLY, Secretary,**
303 N. Grand Avenue.

**Y. H. BOND, Dean,**
Grand and Page Avenue.

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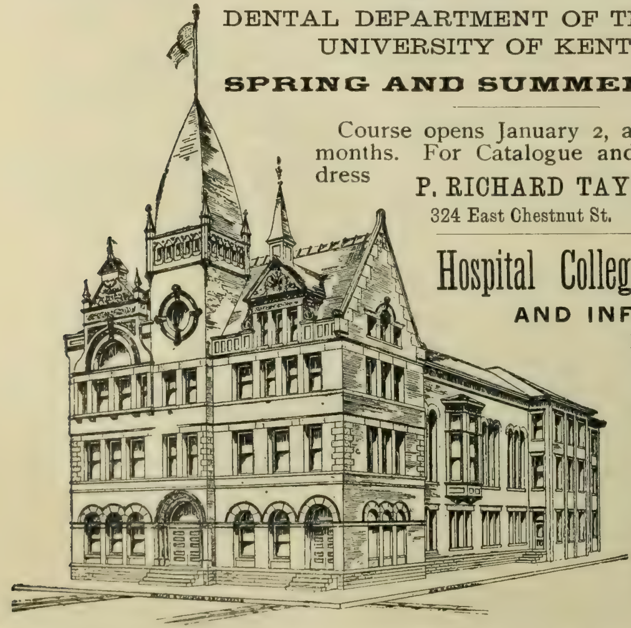
# Louisville College of Dentistry.

DENTAL DEPARTMENT OF THE CENTRAL UNIVERSITY OF KENTUCKY.

**SPRING AND SUMMER SCHOOL.**

Course opens January 2, and continues six months. For Catalogue and particulars, address

**P. RICHARD TAYLOR, M.D., Dean,**
324 East Chestnut St. Louisville, Ky.



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**AND INFIRMARY.**

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Sessions held at the same time as those of the Dental Department.

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## BOSTON, MASS., 1895-96.

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**WILLIAM B. HILLS**, M.D., Assistant Professor of Chemistry.
**CHARLES MINOT**, M.D., Professor of Histology.
**HAROLD C. ERNST**, M.D., Assistant Professor of Bacteriology.
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**JERE E. STANTON**, M.D., D.M.D., Instructor in Oral Anatomy, Physiology, and Bacteriology.
**WILLIAM P. COOKE**, D.M.D., Instructor in Crown- and Bridge-Work.

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**GEORGE L. WALTON**, M.D., Instructor in Neurology.
**EZRA F. TAFT**, D.M.D., Instructor in Operative Dentistry.
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**DWIGHT M. CLAPP**, D.M.D., Clinical Lecturer in Operative Dentistry.
**EDWIN C. BLAISDELL**, D.M.D., Instructor in Operative Dentistry.
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**WILLIAM H. POTTER**, D.M.D., Clinical Lecturer in Operative Dentistry.
**WALDO E. BOARDMAN**, D.M.D., Instructor in Operative Dentistry, and Curator of Museum.
**FREDERICK BRADLEY**, D.M.D., Instructor in Operative Dentistry.
**HENRY L. UPHAM**, D.M.D., Instructor in Operative Dentistry.
**ARTHUR H. STODDARD**, D.M.D., Instructor in Mechanical Dentistry.
**ELLIS P. HOLMES**, D.M.D., Instructor in Operative Dentistry.
**CHARLES E. PERKINS**, D.M.D., Instructor in Operative Dentistry.
**PATRICK W. MORIARTY**, D.M.D., Demonstrator of Mechanical Dentistry.
**THEODORE HALLETT**, D.M.D., Instructor in Mechanical Dentistry.
**HARRY SNOW PARSONS**, D.M.D., Instructor in Operative Dentistry.
**HARRY O. BIXBY**, D.M.D., Instructor in Mechanical Dentistry.
**FRANK T. TAYLOR**, D.M.D., Instructor in Operative Dentistry.
**ARTHUR W. ELDRED**, D.M.D., Instructor in Mechanical Dentistry.
**JOSEPH J. PAUL**, D.M.D., Demonstrator of Operative Dentistry.
**ARTHUR J. OLDHAM**, D.M.D., Instructor in Mechanical Dentistry.
**NATHAN P. WYLLIE**, D.M.D., Assistant Demonstrator of Operative Dentistry.

The Twenty-seventh Annual Session of this school begins Sept. 24, 1895, and ends June 24, 1896, with a recess of one week at Christmas, and another in April, making a school-year of nine months of practically continuous work.

*General Anatomy*, by Dr. Thomas Dwight; *Physiology*, by Dr. H. P. Bowditch; *General Chemistry*, by Dr. Wm. B. Hills; *Histology*, by Dr. Minot; and *Bacteriology* by Dr. Harold C. Ernst, together with ample dissecting under able demonstrators, are the studies of the first year, and are identical with those of the Harvard Medical School. The studies for the second year are Operative and Mechanical Dentistry, Crown- and Bridge-Work, Materia Medica and Therapeutics, and Oral Surgery. Of the third year the studies are Operative and Mechanical Dentistry, Orthodontia, and Surgical Pathology. Attention is called to the fact that *twenty-seven months* of progressive instruction compose the required three years in the school.

All applicants for advanced standing must pass the examinations of the years they desire to omit, or furnish proof that they have passed *equivalent* examinations.

At the end of each year written and oral examinations test the student's knowledge, and he must pass satisfactorily in a majority of the studies of each year before he can pass on to the next year's class.

To those wishing to take the medical degree the studies taken in the first year of this school are allowed in the Medical School of the University, after passing the required entrance examinations.

The University Degree, D.M.D. (*Dentariæ Medicinæ Doctor*), is conferred upon all who fulfill the requirements.

Graduates of recognized dental schools will be admitted to the courses of Operative and Mechanical Dentistry on payment of $50 each, or $100 for both, for the whole or any portion of the academic year.

### FEES.

There are no fees for matriculation, nor for the diploma, nor for the demonstrators. For the first year the student is a member of the school the fee is $200, payable in two installments of $120 and $80; for the second year, $150, in two payments of $100 and $50; for any subsequent year, $50. For information and announcements, address

THOMAS FILLEBROWN, Secretary,
**157 Newbury Street, Boston, Mass.**

# PHILADELPHIA DENTAL COLLEGE
## AND HOSPITAL OF ORAL SURGERY.

**Cherry, above Seventeenth Street.**

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## ANNOUNCEMENT.

THE COLLEGE YEAR begins with the Spring Session, March 1, which Session continues until the last day of May. The Winter Course commences October 1, and closes on the last day of February ensuing. A preliminary Fall Course opens September 1.

**The Dispensary and Laboratory** are open all the year, except during the summer vacation. Instruction in *Practical Dentistry* is a prominent feature of the institution. This work is under the supervision of an executive committee composed of the practicing dentists of the school, the members of which, aided by competent Demonstrators, give special attention to the interests of students. The Dispensary consists of large, well-lighted rooms, furnished with comfortable operating-chairs, tables, and all conveniences. As an excess of patients is in attendance at the clinics, the opportunities here presented for acquiring a knowledge of clinical dentistry are ample and complete. The new laboratory is the largest of its kind in the country.

A clinic in *Oral Surgery* is held every Saturday at 12 M.

**Graduation.**—Attendance on three courses of Lectures and satisfactory examinations in theory and practice are required for graduation. **Graduates in Medicine** are eligible for graduation in Dentistry after attendance on Lectures and Clinical Service during two courses. These are excused from examination on Anatomy, Chemistry, Physiology, and Surgery.

**Fees.**—Tickets for each course, including the Demonstrator's, $100; Matriculation, inclusive of Syllabi for home study, $5 for each course; Examination and Diploma Fee, $25. Board, $4 to $6 per week.

Special Clinics, for the study and treatment of Diseases of the Teeth, are held twice weekly by Professors Flagg and Stellwagen, and on Crown- and Bridge-work Wednesdays and Fridays, at 8 A.M., by Professor Guilford.

Lectures on Descriptive Anatomy, by Dr. Boenning, are given Monday and Thursday evenings, at 8 o'clock.

**Examinations.** First Year.—Progress in Anatomy, Physiology, Anesthetics, and Anesthesia. Second Year.—Progress in Chemistry, Prosthetic and Operative Dentistry, and final in Anatomy, Physiology, and Anesthetics and Anesthesia. Third Year.—Final in Chemistry and Materia Medica, Practical, Prosthetic, and Operative Dentistry, and Dental Pathology and Therapeutics.

**Graduation in Medicine.**—Graduates in Dentistry desiring to take the Medical degree continue their studies in the Medico-Chirurgical College.

### PRACTICAL REQUIREMENTS.

**First Year** (Freshman).—General plate-work in laboratory, and the preparation and filling of at least twenty-four cavities in extracted teeth with Tin foil, Gutta-percha, Zinc phosphate, and Amalgam. The cavities when prepared are to be shown to the demonstrators for criticism or approval, as also the fillings when completed. The best six of the entire number are to be mounted and deposited in the College museum. Any student failing to do the above work satisfactorily, will have his admission to the Junior Class conditioned on completion of it before the middle of the Junior term.

**Second Year** (Junior).—General plate-work and the making of the prescribed depositing plate, also the preparation of roots and the making and mounting of six dowel crowns, three hollow metal crowns, and a piece of bridge-work, including two or more suspended crowns, on teeth out of the mouth.

**Third Year** (Senior).—Making of practical case and the requisite graduation fillings. In special cases, subject to the approval of the Professor of Practice, a case of crown- or bridge-work (in the mouth) may be accepted in lieu of the practical plate. Hours for examination of practical work and graduation fillings, Mondays, Tuesdays, and Saturdays, from 10.30 A.M. to 12 M.

### FACULTY.

HENRY MORTON, A.M., PH.D., Emeritus Professor of Chemistry.
S. H. GUILFORD, D.D.S., PH.D., Professor of Operative and Prosthetic Dentistry.
J. FOSTER FLAGG, D.D.S., Professor of Dental Pathology and Therapeutics.
HENRY I. DORR, M.D., D.D.S., Professor of Practice of Dentistry, Anesthetics, and Anesthesia
S. B. HOWELL, M.D., D.D.S., Professor of Chemistry and Materia Medica.
THOMAS C. STELLWAGEN, M.D., D.D.S., Professor of Physiology.
JAMES E. GARRETSON, M.D., D.D.S., Professor of Anatomy and Surgery. Surgeon to the Oral Clinic.

### DEMONSTRATORS.

*DENTAL DEPARTMENT.*

| | |
|---|---|
| Practice of Dentistry | J. O. ROTHWELL, D.D.S.<br>OTTO E. INGLIS, D.D.S. |
| Prosthetic Dentistry, Crown- and Bridge-Work | R. H. NONES, D.D.S.<br>A. DEWITT GRITMAN, D.D.S. |

*ORAL SURGICAL DEPARTMENT.*

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| Chief Assistant Oral Surgical Clinic | M. H. CRYER, M.D., D.D.S. |
| Demonstrator of Anatomy | HENRY C. BOENNING, M.D. |
| Assistants in Clinical Service | H. A. ICKES, D.D.S.<br>ISIDORE LETT, D.D.S. |

*SCIENTIFIC DEPARTMENT.*

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| Demonstrator of Materia Medica | L. GREENBAUM, M.D., D.D.S. |
| Demonstrator of Histology | E. B. SANGREE, M.D. |
| Demonstrator of Chemistry | H. H. BOON, M.D. |

**For announcements containing particulars, address**

**Dr. JAMES E. GARRETSON, Dean of the Faculty,**
**1537 Chestnut St., PHILADELPHIA.**

# University of California.

## COLLEGE OF DENTISTRY,

Donohoe Building, Corner of Market and Taylor Streets,

SAN FRANCISCO.

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L. L. DUNBAR, D.D.S., Dean, and Professor of Operative Dentistry.
MAURICE J. SULLIVAN, D.D.S., Professor of Dental Pathology, Therapeutics, and Materia Medica.
WILLIAM B. LEWITT, M.D., Professor of the Principles and Practice of Surgery.
A. L. LENGFELD, M.D., Professor of Chemistry and Metallurgy.
A. A. D'ANCONA, A.B., M.D., Professor of Physiology and Histology.
JOHN M. WILLIAMSON, M.D., Professor of Anatomy.

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H. R. WILEY, A.B., Lecturer on Dental Jurisprudence.
CHARLES A. LITTON, D.D.S., Superintendent of Infirmary.
M. J. SULLIVAN, D.D.S., Instructor in Clinical Operative Dentistry.
HARRY P. CARLTON, D.D.S., Instructor in Operative Technic.
PAUL C. ERHARDT, D.D.S., Demonstrator of Operative Dentistry.
W. F. SHARP, D.D.S., D.M.D., Instructor in Clinical Mechanical Dentistry.
P. C. ERHARDT, D.D.S., Assistant in Operative Dentistry.
WALTER I. WILCOX, D.D.S., Demonstrator of Mechanical Dentistry.
JAMES W. LIKENS, D.D.S., Demonstrator of Operative Dentistry.
HAROLD L. SAEGER, D.D.S., Assistant Demonstrator of Mechanical and Operative Technic.
JOHN H. BARBAT, PH.G., M.D., Demonstrator of Anatomy.
O. W. JONES, M.D., Assistant Demonstrator of Anatomy.
S. J. FRASER, A.B., M.D., Assistant Demonstrator of Anatomy.
J. D. HODGEN, D.D.S., Assistant in Chemistry and Metallurgy.
H. D. NOBLE, D.D.S., Demonstrator of Orthodontia Technic.
JAMES G. SHARP, D.D.S., M.D., Assistant to the Chair of Physiology and Histology.

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| GEO. H. CHANCE, D.D.S., M.D. | Portland, Oregon | W. E. PRICE, D.D.S. | San Francisco |
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Hon. SEVERN TEACKLE WALLIS, LL.D., Provost.

## FACULTY.

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**JAMES H. HARRIS, M.D., D.D.S.**, Professor of Operative and Clinical Dentistry.

**FRANCIS T. MILES, M.D.**, Professor of Physiology.

**. McLANE TIFFANY, M.D.**, Clinical Professor of Oral Surgery.

**RANDOLPH WINSLOW, M.D.**, Professor of Anatomy.

**R. DORSEY COALE, PH.D.**, Professor of Chemistry and Metallurgy.

**I. EDMONDSON ATKINSON, M.D.**, Professor of Materia Medica and Therapeutics.

**JOHN C. UHLER, M.D., D.D.S.**, Demonstrator of Mechanical Dentistry.

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The Principal Demonstrators are assisted by *sixteen* Assistant Demonstrators. Special Instructions are given in Continuous-Gum and Bridge-Work.

At stated times during the Annual Sessions a number of prominent dental practitioners will hold Clinics and deliver Clinical Lectures.

Each year since its organization has added to the reputation and prosperity of this University Dental School, until now its graduates, in almost every part of the civilized world, are meeting with the success that ability will ever command. The past session was the most successful one in number of matriculates ever held; and visiting dentists from all parts of this country have expressed themselves as being astonished and gratified at the ability shown by the students when operating upon patients in the Infirmary. Forming one of the departments of *one of the oldest Universities* in this country, its diploma is everywhere recognized and honored.

The instruction in both operative and mechanical dentistry is as thorough as it is possible to make it, and embraces everything pertaining to dental art. The advantages which the general and oral surgical clinics, to which the dental students are admitted, as indeed to all the lectures of the University, afford, cannot be overestimated. The many thousands of patients annually treated in the University Hospital, well known to be the largest Hospital in Baltimore, afford an abundance of material for dental infirmary and laboratory practice, and the oral surgery clinics.

The Infirmary and Laboratory practice for students is exceptionally large, a fact that adds so greatly to the facilities of this Dental School.

The Dental Infirmary and Laboratory Building is one of the largest and most complete structures of the kind in the world. The Infirmary is lighted by forty-seven large windows, and is furnished with the most improved operating chairs. It has again become necessary to enlarge the Dental Building, making an Infirmary nearly one hundred feet long, and a Laboratory eighty feet long and forty-three feet wide.

The Dental Infirmary and Laboratory are open daily (except Sundays) during the entire year for the reception of patients· and *the practice for dental students* has increased to such an extent that all the students during the past session have had an abundance of practical work in both operative and prosthetic dentistry. This means for practical instruction has already assumed such large proportions that the supply has been beyond the needs of the large classes in attendance during the past sessions. The exceedingly large number of patients for the extraction of teeth affords ample facilities for practical experience to every student.

In addition to the facilities afforded by this institution for a thorough course of instruction in the theory and practice of dentistry, the clinics in the University Hospital enable the Dental equally with the Medical Students to become familiar with the diseases and operations of Practical Surgery. Excisions of jaw, partial or entire; tumors, cancerous or benign, of various parts of the buccal cavity; plastic operations for restoration of cheek, lips, etc., may be mentioned as having been before the class during the year. The induction of anesthesia by means of different agents—ether, chloroform, bromide of ethyl, nitrous oxide gas, all being used in the clinics—cannot fail to be of use to the student of Oral Surgery. Junior as well as Senior students are afforded every opportunity for practical instruction in both operative and mechanical dentistry.

The Lecture Halls in the University Buildings are large and well lighted; and every facility will be afforded for practical and theoretical dental instruction. Demonstrations in Anatomy, Physiology, and Pathology (for which an abundance of material is furnished free of charge), also form an important part of the regular course. The Dissecting Room is large, well ventilated and lighted, and the Demonstrator of Practical Anatomy passes much of his time in assisting the students and directing their labors. Dissecting Material is furnished in abundance, free of charge.

The Qualifications for Admission and Graduation are those adopted by the National Association of Dental Faculties and the State Dental Examining Boards. The Diplomas of this School are recognized by all State Dental Examining Boards.

Qualifications for Graduation: The candidate must have attended three full courses of lectures of five months each in different years at the Regular or Winter Sessions in this institution. As equivalent to one of these, one course in any reputable dental college will be accepted. Graduates of medicine can enter the Junior Class. The matriculant must have a good English

education; a diploma from a reputable literary institution, or other evidence of literary qualifications will be received instead of a preliminary examination. All students, both juniors and seniors, have equal advantage in operative and mechanical dentistry in this institution throughout every session.

**Graduation in Medicine:** Graduates of the Dental Department of the University of Maryland are required to attend but one session at the University School of Medicine prior to presenting themselves as candidates for the degree of "Doctor of Medicine." (See Catalogue.)

The Regular or Winter Session will begin on the 1st day of October, and will terminate in March of each year.

The Summer Session, for practical instruction, will commence in March, and continue until the regular Session begins. Students in attendance on the Summer Session will have the advantages of all the daily Surgical and Medical Clinics of the University.

The fees for the Regular Session are $100, Demonstrators' Fees included; Matriculation Fee, $5; Diploma Fee, for candidates for graduation, $30; Dissecting Ticket, $10.

For Summer Session, no charge to those who attend the following Winter Session.

**Beneficiary.**—A Beneficiary student will be received from each State, on the recommendation of the State Dental Society, on the payment of half of the tuition fees. Board can be obtained at from $3.50 to $5 per week, according to quality.

The University Prize and a number of other Prizes will be specified in the annual Catalogue.

Students desiring information and the annual Catalogue will be careful to give full address and direct their letters to

**F. J. S. GORGAS, M.D., D.D.S.,**

*Dean of the Dental Department of the University of Maryland,*

**845 N. Eutaw Street, Baltimore, Md.**

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## The Haskell Post-Graduate School of Prosthetic Dentistry.

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A. M. MARKLE, Secretary.

This School, now in its fifth year, has a large and well-equipped laboratory, including electric motor for its lathes, and is open continuously. Students may enter at any time.

Instruction given in all that pertains to PROSTHETIC DENTISTRY, including Metal Plates; Selection and Arrangement of Teeth; Crown- and Bridge-Work; Continuous-Gum Work; Porcelain Inlays; and the Parmly Brown method of Porcelain Crowns and Bridges.

One month of technical instruction under the personal supervision of Prof. Haskell and assistants has been found sufficient time for these specialties.

### Tuition Fifty Dollars.

The laboratory is prepared to construct dentures of all kinds for the profession. Send for Price-List.

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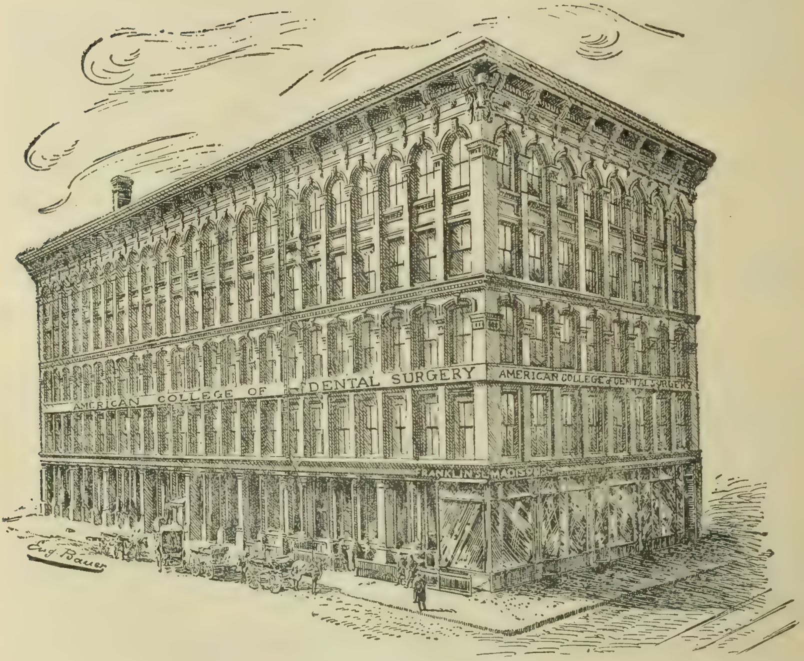
of the superiority of the "Revelation" Bur is that it is the one which all other manufacturers have been trying to beat for years. But they haven't done it yet.

# American College of Dental Surgery.


AMERICAN COLLEGE OF DENTAL SURGERY
AMERICAN COLLEGE of DENTAL SURGERY
FRANKLIN St. MADISON St.
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After May 1, 1895,

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Fall and Winter Sessions of Lectures and Clinics,
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Post-Graduate Course from April 1 to October 1.

**For Catalogue and Circulars address**

**THEO. MENGES, D.D.S.,**
Cor. Madison and Franklin Sts., Chicago, Ill.

# BOSTON DENTAL COLLEGE.

## 563 TREMONT STREET.

## 1893-94.

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## FACULTY.

JOHN A. FOLLETT, A.M., M.D., Dean, Professor of Anatomy and Physiology.
EDWARD W. BRANIGAN, D.D.S., Professor of Clinical Dentistry.
GEORGE F. EAMES, M.D., D.D.S., Professor of Pathology and Therapeutics.
HERBERT L. SMITH, A.M., M.D., Professor of Principles and Practice of Surgery.
JAMES H. DALY, D.D.S., Professor of Dental Science and Operative Dentistry.
GEORGE A. BATES, D.D.S., Professor of Dental Histology and Microscopy.
JOHN B. COOLIDGE, M.D., D.D.S., Professor of Dental Art and Mechanism.
JOEL E. GOLDTHWAIT, M.D., Adjunct Professor of Principles and Practice of Surgery.
GREENLEAF R. TUCKER, Ph.G., S.B., Professor of Chemistry, Physics, and Metallurgy.

## INSTRUCTORS.

WILLIAM A. WHITE, M.D., Instructor in Materia Medica.
WILLARD A. CURRIE, D.D.S., Instructor in Carving and Plastic Manipulation.
FREDERICK S. BELYEA, D.D.S., Instructor in Bridge-Work.
E. V. McLEOD, D.D.S., Instructor in Clinical Dentistry.
W. P. HOUSTON, D.D.S., Instructor in Clinical Dentistry.
W. G. KENDALL, D.D.S., Instructor in Clinical Dentistry.
E O. KINSMAN, D.D.S., Instructor in Clinical Dentistry.
JOHN B. GILLON, D.D.S., Instructor in Clinical Dentistry.
JAMES R. PIPER, D.D.S., Instructor in Clinical Dentistry.
L. E. BREWSTER, D.D.S., Instructor in Clinical Dentistry.
S. P. WILLARD, D.D S., Instructor in Clinical Dentistry.
F. B. JOHNSTON, D.D.S., Instructor in Clinical Dentistry.
ALBERT H. KETCHEM, D.D.S., Instructor in Clinical Dentistry.
WILLIAM J. KELLY, D.D.S., Instructor in Clinical Dentistry.
J. WINSLOW BAILEY, D D.S., Instructor in Mechanical Dentistry.
ALPHEUS R. BROWN, D.D.S., Instructor in Mechanical Dentistry.

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Professor in charge, EDWARD W. BRANIGAN, D.D.S.

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Librarian, GEORGE A. BATES, D.D.S.

The year begins on the second Monday in September and ends on the third Wednesday in June.

It is the object of the Faculty to present a complete course of instruction in the theory and practice of Dentistry; for this purpose a well-appointed laboratory and infirmary are provided, at which there is an ample number of patients, insuring to all students abundant opportunities for operating at the chair and becoming by actual practice familiar with all the operations demanded of the dentist.

The Laboratory and Operating Room are open at 9 o'clock A.M. Demonstrators are present daily during working hours.

Students who began their professional studies elsewhere may be admitted to advanced standing. No student can advance with his class or be admitted to advanced standing until he has passed the required examination on the studies of the previous year.

Every candidate for the degree must have passed a satisfactory examination in every one of the departments of dental instruction at regular periods of the College course.

All candidates for admission are required before examination to produce certificates of good moral character, and students from other colleges are required to bring certificates from those colleges of honorable dismission. For admission they must present a degree in letters, science, or medicine from a recognized college or scientific school, or pass an examination in the following subjects:

1.—English. Every candidate will be required to write legibly and correctly an English composition, and also to write English prose from dictation.

2.—Physics. A competent knowledge of physics. (See Balfour Stewart's "Elements of Physics.")

Candidates from foreign countries must be able to speak the English language.

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## FEES AND EXPENSES.

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|---|---|
| For Matriculation | $5.00 |
| For a year | 100.00 |
| For Demonstrator's Ticket (Anatomy) | 5.00 |

There is no Diploma Fee and no Fee for Graduation.

For further information address

**J. A. FOLLETT, M.D., Dean,**

**Hotel Nightingale, 637 Dudley St., Boston, Mass.**

# New York College of Dentistry,

205-7 East Twenty-third Street,

NEW YORK, U. S. A.

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The attention of students is respectfully called to the following announcement by the N. Y. C. D.

1 *A yearly advance in the preliminary education requirements of students entering the college* (see page 3).

2 *A yearly lengthening of the lecture session—that of 1894–95 to six months, that of 1895–96 to seven months, and that of 1896–97 to eight months.*

3 *The requirement of evidence, prior to graduation, of three years' actual study and practice of dental surgery, inclusive of attendance on three lecture sessions, in separate years.*

4 *The inauguration, during the lecture session of 1894–95, of graded courses of practical work in subclasses, for the first year class, the second year class, and the third year class, respectively.*

*c* All students taking their first matriculation from October 21, 1894, to October 20, 1895, inclusive, thereby becoming candidates for degrees in the class graduating in 1898, must file a 12-academic-count or higher regents' certificate within one year after said matriculation.

*d* All students taking their first matriculation from October 21, 1895, to October 20, 1896, inclusive, thereby becoming candidates for degrees in the class graduating in 1899, must file a 24-academic-count or higher regents' certificate within one year after said matriculation.

*e* All students taking their first matriculation from October 21, 1896, to October 20, 1897, inclusive, thereby becoming candidates for degrees in the class graduating in 1900, must file a 48-academic-count or higher regents' certificate within one year after said matriculation.

*f* All students taking their first matriculation after October 21, 1897, must file a 48-academic-count or higher regents' certificate at the time of said matriculation.

For further particulars, or the College Catalogue, address

**FRANK ABBOTT, M.D., Dean,**
22 West Fortieth St., New York.

# The Baltimore College of Dental Surgery,

Chartered by the Legislature of Maryland in 1839.

## THE OLDEST DENTAL COLLEGE IN THE WORLD.

## FACULTY.

M. WHILLDIN FOSTER, M.D., D.D.S., Professor of Therapeutics and Pathology.
WM. B. FINNEY, D.D.S., Professor of Dental Mechanism and Metallurgy.
B. HOLLY SMITH, M.D., D.D.S., Professor of Dental Surgery and Operative Dentistry.
THOMAS S. LATIMER, M.D., Professor of Physiology.
WILLIAM SIMON, M.D., Ph.D., Professor of Chemistry.
CHARLES F. BEVAN, M.D., Clinical Professor of Oral Surgery.
J. W. CHAMBERS, M.D., Professor of Anatomy.
GEORGE H. ROHE, M.D., Professor of Materia Medica.

## LECTURERS.

R. BAYLY WINDER, Phar. G., D.D.S., Materia Medica.
WM. F. SMITH, A.B., M.D., Regional Anatomy.
J. N. FARRAR, M.D., D.D.S., Irregularities.
J. MEYER, D.D.S., Continuous-Gum.
Dr. GEORGE EVANS, Crown- and Bridge-Work.
Dr. K. C. GIBSON, Artificial Palates and Fractured Maxillaries.

## CLINICAL INSTRUCTORS.

T. S. WATERS, D.D.S., Chief Clinical Instructor, Resident.

| | | | |
|---|---|---|---|
| CORYDON PALMER, D.D.S. | Ohio. | C. M. GINGRICH, D.D.S., Resident | Md. |
| E. PARMLY BROWN, D.D.S. | N. Y. | J. HALL MOORE, M.D. | Va. |
| A. L. NORTHROP, D.D.S. | N. Y. | JOHN ALLEN, D.D.S. | N. Y. |
| CHAS. R. BUTLER, D.D.S. | Ohio. | R. B. DONALDSON, D.D.S. | D. C. |
| E. L. HUNTER, D.D.S. | N. C. | H. A. PARR, D.D.S. | N. Y. |
| W. W. WALKER, D.D.S. | N. Y. | J. EMORY SCOTT, D.D.S. | Md. |
| T. S. WATERS, D.D.S. | Md. | E. R. RUST, D.D.S. | D. C. |
| DAVID GENESE, D.D.S. | Md. | C. L. ALEXANDER, D.D.S. | N. C. |
| F. C. BARLOW, D.D.S. | N. J. | C. A. MEEKER, D.D.S. | N. J. |

## DEMONSTRATORS.

W. G. FOSTER, D.D.S., Demonstrator of Operative Dentistry.
GEORGE E. HARDY, M.D., D.D.S., Demonstrator of Mechanical Dentistry.

## ASSISTANT DEMONSTRATORS.

W. W. DUNBRACCO, D.D.S.
W. S. TWILLEY, D.D.S.
G. MARSHALL SMITH, D.D.S.
J. S. SUTHERLAND, D.D.S.

W. F. SMITH, A.B., M.D., Demonstrator of Anatomy.
LOUIS F. ANKRIM, M.D., Assistant Demonstrator of Anatomy.
R. G. DAVIS, M.D., Assistant Demonstrator of Anatomy.
W. F. SMITH, A.B., M.D., Assistant Demonstrator of Anatomy.

The Baltimore College of Dental Surgery, the first, and for many years the only dental school, offers facilities for the study of dentistry proper, such as age and experience only can give. Its immense museum, complete apparatus, large and well-arranged building, and carefully studied curriculum, give to its students great advantages and opportunities, both theoretical and practical, while its age gives its diploma a dignity far outranking all other colleges—a diploma honorably represented in all civilized countries, and held by the most distinguished members of the dental profession.

The fact that dentistry must be practically taught is fully recognized, the College Infirmary, a most complete, large, and handsome hall, being daily filled with clean and respectable patients, of a class nearly equal to those of the average dentist. The Infirmary is open all the year, students paying an entrance fee, which is deducted from those of the regular succeeding course.

The session begins October 1, closing in March. A large corps of demonstrators, always present, put in actual practice the teachings of all lecturers in dentistry—leaving nothing undemonstrated. All methods are fully taught, all appliances and apparatus used; the making of instruments and the most elaborate gold and continuous-gum work, and all the cases arising in ordinary practice, with many which are rarely seen, carefully demonstrated.

Commencing October 1, 1895, women will be admitted to this College, subject to the same requirements as men.

The College has formed an alliance with the College of Physicians and Surgeons by which its students are privileged to attend all lectures and clinics. The patients of this medical school numbered last year over 40,000.

Graduates of the Baltimore College of Dental Surgery are required to attend but one session at the College of Physicians and Surgeons prior to presenting themselves as candidates for the degree of M.D. (See Catalogue.) In accordance with the resolutions adopted by the National Association of Dental Faculties, which go into effect for the session of 1891 and 1892, the qualifications for entering the first year's course are a preliminary examination in the ordinary English branches.

**TERMS OF GRADUATION.**—Attendance on three winter courses of lectures in this College; as equivalent to one of these we accept one course in any reputable dental college. Graduates in Medicine can enter the Junior class.

**BENEFICIARY STUDENTS.**—Each State Dental Society is privileged to send one Beneficiary Student to this College at one-half the regular fees. This has been for some years an established feature of this College.

**FEES.**—Matriculation (paid once only), $5.00. Tuition fees, $100.00. Diploma fee, $30.00. Dissecting fee, $10.00.

Students corresponding with the Dean will please be careful to give full address, and direct their letters to

**Prof. M. W. FOSTER, Dean,**

No. 9 W. Franklin St., Baltimore, M

# UNIVERSITY OF PENNSYLVANIA.

## DEPARTMENT OF DENTISTRY,

Thirty-Sixth Street and Woodland Avenue, Philadelphia.

## FACULTY.

**Charles C. Harrison**, A.M., Acting Provost, and *ex-officio* President.

**Charles J. Essig**, M.D., D.D.S., Professor of Mechanical Dentistry and Metallurgy.
**Edwin T. Darby**, M.D., D.D.S., Professor of Operative Dentistry and Dental Histology.
**James Truman**, D.D.S., Professor of Dental Pathology, Therapeutics, and Materia Medica.
**Theodore G. Wormley**, M.D., LL.D., Professor of Chemistry.
**Edward T. Reichert**, M.D., Professor of Physiology.
**George A. Piersol**, M.D., Professor of Anatomy.
**John Marshall**, M.D., Nat. Sc. D., Assistant Professor of Chemistry.

**Robert Huey**, D.D.S., Lecturer on Operative Dentistry.
**Edward C. Kirk**, D.D.S., Lecturer on Operative Dentistry.
**John D. Thomas**, D.D.S., Lecturer on Nitrous Oxide.
**Norman Sturges Essig**, D.D.S., Lecturer on Mechanical Dentistry.
**Meyer L. Rhein**, M.D., D.D.S., Lecturer on Dental Pathology.

## CLINICAL INSTRUCTORS.

Dr. C. S. Beck.
Dr. W. G. A. Bonwill.
Dr. W. R. Millard.
Dr. D. N. McQuillen.
Dr. E. H. Neall.
Dr. H. C. Register.
Dr. Geo. W. Klump.
Dr. Edw. I. Keffer.
Dr. John R. Yorks.
Dr. R. R. Underwood.
Dr. I. F. Wardwell.
Dr. J. A. Woodward.
Dr. W. E. Christensen.

## DEMONSTRATORS.

**William Diehl**, D.D.S., Demonstrator of Operative Dentistry.
**Joseph W. White**, D.D.S., Assistant Demonstrator of Operative Dentistry.
**James E. Loder**, D.D.S., Assistant Demonstrator of Operative Dentistry.
**J. E. Dunwoody**, D.D.S., Assistant Demonstrator of Operative Dentistry.
**R. Hamill D. Swing**, D.D.S., Assistant Demonstrator of Operative Dentistry.
**Louis E. Rauch**, D.D.S., Assistant Demonstrator of Operative Dentistry.
**J. Thomas Lippincott**, D.D.S., Assistant Demonstrator of Operative Dentistry.
**Harry B. McFadden**, D.D.S., Demonstrator of Mechanical Dentistry.
**Ambler Tees**, D.D.S., Assistant Demonstrator of Mechanical Dentistry, and Demonstrator of Continuous-Gum Work.
**Frederick W. Amend, Jr.**, D.D.S., Assistant Demonstrator of Mechanical Dentistry.
**Milton N. Keim, Jr.**, D.D.S., Assistant Demonstrator of Mechanical Dentistry.
**Frederick A. Peeso**, D.D.S., Demonstrator of Crown- and Bridge-work.
**James G. Lane**, D.D.S., Assistant Demonstrator of Crown- and Bridge-work.
**Robert J. Seymour**, D.D.S., Assistant Demonstrator of Mechanical Dentistry.
**Robert Formad**, M.D., Demonstrator of Normal Histology.
**Edmund W. Holmes**, M.D., Demonstrator of Anatomy.
**Richard H. Harte**, M.D., Demonstrator of Osteology.

The course of instruction is graded and extends over three years, with one session beginning first of October and ending early in June in each year.

Laboratory instruction of each student, not only in Practical Dentistry but also in Practical Chemistry and Histology, forms a prominent feature in this Department.

The appointments of the Lecture-Rooms, Operating-Room, and Laboratories, are as complete as any in America.

## FEES.

| | | | |
|---|---|---|---|
| Matriculation Fee (paid once only) | $5.00 | Dissecting Fee (Second Year) . . | $10.00 |
| Fee for One Course of Lectures . . | 100.00 | Graduation Fee (Third Year) . . | 30.00 |

Board can be obtained at from five to eight dollars per week, according to location and accommodations. In locations near the college, students generally pay about five dollars per week.

Students of the Dental Department have access without additional charge to all the other lectures and clinics in the Medical Deparment.

Surgical clinics at University Hospital twice a week; at Philadelphia Hospital, contiguous to the grounds of the University, Wednesday and Saturday.

# University of Pennsylvania.—Dental Department.

The dental department possesses the means for thorough training, both theoretical and practical, not surpassed, it is believed, by any other institution. The operating-room is 140 feet in length by 40 feet in width, and lighted by windows on all sides. In front of each window is placed a Morrison Chair, a handsome nickel-plated movable bracket, and a neat walnut table. Battery wires are arranged to a number of the chairs for the use of electric pluggers.

The Mechanical Laboratory is supplied with all the modern appliances, and is under the care of an able and experienced mechanician. Special clinics will be given in continuous-gum and crown- and bridge-work.

The extensive Chemical Laboratories are under the charge of a demonstrator well qualified to meet all the requirements of his position.

The Dissecting-Room is large, well lighted, thoroughly ventilated, and is furnished with ample material for the successful prosecution of anatomical studies.

## THE REGULAR OR WINTER SESSION.

The session will commence October 1, and ends at Commencement, early in June. The number of lectures per week, with a synopsis of the various branches taught, will be found in the General Catalogue.

In order to facilitate work in the practical departments, and to fully employ the student's time, the regular winter sessions are so arranged that the first-course student is required to devote the morning hours equally between *dental, histological, and chemical laboratory work.*

During the second and third years the student has the entire forenoon of each day for practical dental work. Ample opportunity is afforded for practice in operative and mechanical dentistry. In the latter branch, the students of the first year are divided into sections, thus devoting the time not otherwise engaged to practice in the operative and mechanical rooms.

It is believed that this plan of *grading the course*, and of affording the first-year student an opportunity of coming forward for examination in the branches of chemistry, histology, and materia medica, and the second-year student upon anatomy and physiology, will not only prove an economical arrangement of his time, but will really facilitate his labors in the acquirement of knowledge in the remaining branches.

## PLAN OF EXAMINATIONS.

Attendance upon three regular courses of lectures will be required before the final examination for the degree of Doctor of Dental Surgery.

At the close of the first year, examinations are held in *chemistry, histology, and materia medica*, and the second year upon *osteology*, *anatomy* and *physiology*. If the student is not qualified, a second examination is afforded him at the beginning of the next winter session.

The final examination at the close of the third year is in *operative dentistry*, *mechanical dentistry*, *metallurgy*, *dental pathology and therapeutics.*

All applicants for advanced standing must pass the required examinations of this school, or furnish proof that they have passed *equivalent* examinations in some recognized dental or medical school. Graduates of a recognized medical college will be admitted to the second-year class without examination.

## CONDITIONS OF ADMISSION.

Candidates for admission are required: *First*, to write an essay (not exceeding a page of foolscap) as a test of orthography and grammar. *Second*, to pass an examination in the English branches, viz: grammar, arithmetic, history, and geography.

A candidate who has received a collegiate degree or passed the matriculate examination of a recognized college, or who has a certificate from a normal, high, or grammar school, or a teacher's certificate properly attested, may enter without examination.

For information and announcements address

JAMES TRUMAN, D.D.S.,
*Dean of the Dental Faculty, 3243 Chestnut Street,*
**PHILADELPHIA, PA.**

# Chicago College of Dental Surgery.

## Dental Department of Lake Forest University.

The Annual Winter Course of Instruction will begin about October 1, 1895, and end about April 1, 1896.

Three full winter courses of lectures are required before graduation. Graduates of reputable pharmaceutical and undergraduates of medical colleges are admitted to the second-year course, and can become candidates for graduation after taking two winter courses of lectures.

## GRADUATION IN MEDICINE.

Graduates of the Chicago College of Dental Surgery will be admitted to the medical colleges, and may become candidates for graduation in medicine after attending two full courses of lectures.

Graduates of the Chicago College of Dental Surgery are excused from the lectures on anatomy, physiology, and chemistry, from chemical and histological laboratory work, and dissecting.

Students desiring to graduate in medicine are required to notify the Dean in writing of their intention at the beginning of their second course.

## TOPICAL STATEMENT OF WORK.

### FIRST YEAR.

During the Freshman year the studies taken up are Theoretical and Practical Chemistry and Anatomy, Histology, Operative and Prosthetic Technics and Operative and Prosthetic Dentistry and Physiology, and during the latter part of the term some practical work in the Infirmary.

### SECOND YEAR.

In the Junior year the studies of the Freshman year are reviewed, and the student performs practical work in the laboratories and operates in the Infirmary.

### THIRD YEAR.

During the third year the student listens to lectures on Oral Surgery, Materia Medica and Therapeutics, Pathology, Operative Dentistry, Dental Anatomy and Pathology, and Orthodontia. In addition to the lectures, each student is expected to operate in the Infirmary and perform practical work in the Laboratory.

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|---|---|
| Matriculation Fee, good to the close of the term . . | $5.00 |
| General Ticket . . . . . . . . . | 100.00 |

There will be no separate fees for Chemical and Histological Laboratory work, Dissecting, and final examinations, as heretofore.

## FEES FOR THE ANNUAL SPRING AND SUMMER COURSE.

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|---|---|
| Matriculation Fee (good till the following April) . . . | $5.00 |
| Tickets for the Course . . . . . . . . . | 20.00 |

This amount will be deducted from the fees of the next following winter session.

Instruments and appliances for clinical department will cost from $25 to $40.

Board, including light and fuel, can be obtained at a convenient distance from the College, at from $4 to $6 a week.

Graduates of the College are requested to notify the Dean of changes in their residences.

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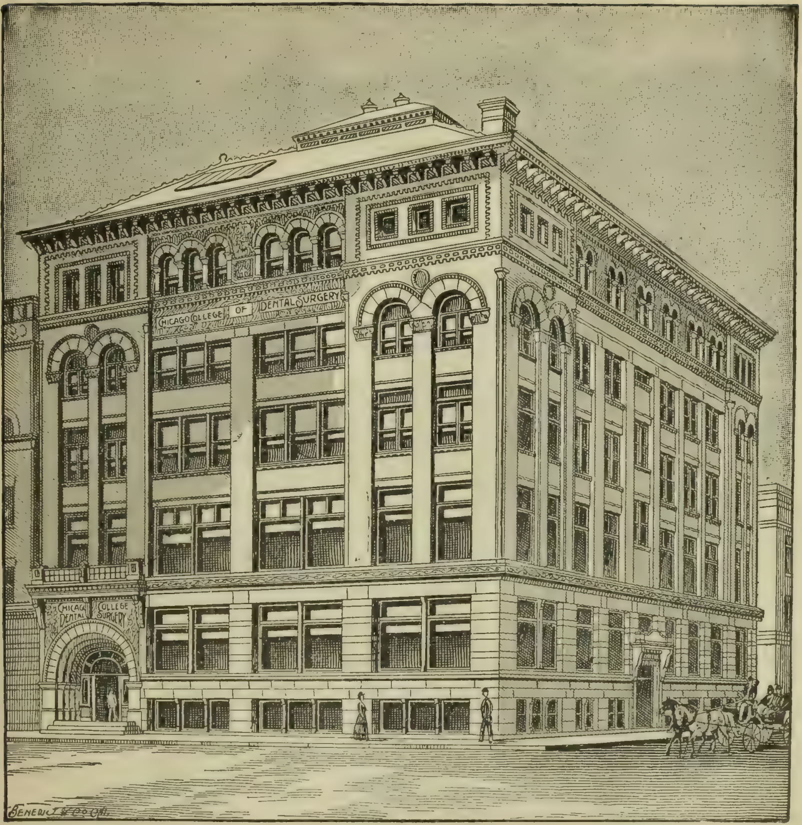
*A fee of $5 must be deposited to cover chemicals and breakage in the Chemical Laboratory.

Letters of inquiry should be addressed to

**DR. TRUMAN W. BROPHY, Dean,**
126 State Street, Chicago, Ill.


CHICAGO COLLEGE OF DENTAL SURGERY
CHICAGO COLLEGE DENTAL SURGERY
BENEDICT & CO. CHI.

**THE COLLEGE BUILDING.**

S. E. Cor. Wood and Harrison Sts.

The new college building occupies a prominent position among a group of fourteen others, comprising medical colleges, hospitals, and schools.

The lot on which the building stands has a frontage of eighty-five feet, and a depth of one hundred and twenty feet. It is a five-story and basement structure, the basement and first story being of rock-faced Bedford stone, and the superstructure of pressed brick and terra-cotta, with terra-cotta trimmings.

The building has two entrances, the main one through a large cut stone doorway surmounted by a stone arch beautifully ornamented with carved work. The interior is finished in hard wood, according to the latest idea of elegance, convenience, and comfort.

The entire six floors of the building are divided up into lecture rooms, class rooms, clinic rooms, etc., with the exception of the second floor, which is devoted to the Dental Infirmary. The chief lecture room has a seating capacity for four hundred and fifty students. There is also a dissecting room, thoroughly equipped with all the requisites for the study of human anatomy.

There are Histological, Chemical, Bacteriological Laboratories, also Laboratories for the study of Operative and Prosthetic Technics, and one for the construction of artificial dentures.

The building occupied by the Chicago College of Dental Surgery is, in all its appointments, one of the most perfect and complete of its kind.

Letters of inquiry should be addressed to

**DR. TRUMAN W. BROPHY, Dean,**

**126 State Street, Chicago, Ill.**

# Pennsylvania College of Dental Surgery.

Eleventh Street, below Spruce, corner of Clinton.

## FORTIETH ANNUAL SESSION, 1895-96.

## FACULTY AND AUXILIARY INSTRUCTORS.

J. EWING MEARS, A.M., M.D., Professor of Anatomy and Surgery.

C. N. PEIRCE, D.D.S., Professor of Physiology, Dental Pathology, and Operative Dentistry.

WILBUR F. LITCH, M.D., D.D.S., Professor of Prosthetic Dentistry, Materia Medica, and Therapeutics.

HENRY LEFFMANN, M.D., D.D.S., Professor of Chemistry and Metallurgy.

ALBERT P. BRUBAKER, M.D., D.D.S., Professor of Physiology and General Pathology.

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PERCIVAL E. LODER, M.D., D.D.S., Demonstrator of Anatomy.
GEO. W. WARREN, D.D.S., Chief of the Clinics and Demonstrator of Operative Dentistry
I. NORMAN BROOMELL, D.D.S., Demonstrator of Prosthetic Dentistry.
EDWARD F. WAYNE, D.D.S., Demonstrator of Chemistry.
FREDERICK R. BRUNET, D.D.S., Demonstrator of Prosthetic Dentistry.
RUPERT BEALE, D.D.S., Demonstrator of Prosthetic Dentistry.
WILLIAM B. WARREN, D.D.S., Demonstrator of Operative Dentistry.
A. W. DEANE, D.D.S., Demonstrator of Prosthetic Dentistry.
R. WALTER STARR, D.D.S., Instructor in Crown- and Bridge-Work.
W. K. THORPE, D.D.S., Demonstrator of Operative Dentistry.
CHARLES S. HEARN, M.D., Instructor in Histology and Microscopy.
MARTHA ALLAIRE TERRY, D.D.S., Demonstrator of Operative Dentistry.
LUTHER G. TERRY, D.D.S., Demonstrator of Operative Dentistry.
E. ROLAND HEARN, D.D.S., Demonstrator of Operative Dentistry.
LOUIS BRITTON, D.D.S., Demonstrator of Operative Dentistry.
F. W. PROSEUS, D.D.S., Demonstrator of Operative Dentistry.
E. A. KRETSCHMAN, Instructor in Modeling.
F. A. CONEY, D.D.S., Instructor in Carving Block-Teeth and Full Porcelain Dentures.

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## CLINICAL INSTRUCTORS.

Dr. J. N. FARRAR,
Dr. W. G. A. BONWILL,
Dr. A. L. NORTHROP,
Dr. C. S. STOCKTON,
Dr. CHAS. F. BONSALL,
Dr. C. E. FRANCIS,
Dr. E. C. BAXTER,
Dr. A. H. BROCKWAY,
Dr. C. PALMER,
Dr. R. H. SHOEMAKER,
Dr. T. F. CHUPEIN,
Dr. W. R. MILLARD,
Dr. W. H. TRUEMAN,
Dr. R. HOLLENBACK,
Dr. J. G. TEMPLETON,
Dr. A. B. ABELL.

This College has accepted the requirements of the National Association of Dental Faculties with regard to admission and graduation of students. (See announcement for 1895-96, which can be procured from the Dean.)

## THE SPRING AND FALL SESSIONS.

THE SPRING COURSE commences on the second Monday in April and continues unti June 20. Fee, $50, which will be credited upon the fee for the regular session.

THE FALL COURSE will commence September 3, and continue until the first of October, and will be free to those who matriculate for the regular session.

Attendance upon the Spring and Fall Courses will be deemed equivalent to the term of pupilage under a private preceptor.

## THE REGULAR SESSION

Will commence on October 1, and continue until the 2d of April ensuing. Twenty lectures will be delivered each week on the various branches taught.

## CLINICAL PRACTICE.

Lecture hours excepted, general clinical practice is available for the student continuously through the day. Competent instructors are always present.

## GRADUATION IN MEDICINE.

By an arrangement with Jefferson Medical College, such students as may desire to do so can, if found qualified, obtain the two degrees, in Dentistry and Medicine, in five years. Students desiring to graduate in medicine are required to notify the Dean of their intention at the beginning of their second course.

## FEES.

| | |
|---|---|
| Matriculation (paid but once) | $5.00 |
| For the Course (Demonstrators' Ticket included). | 100.00 |
| Dissecting Fee | 10.00 |
| Diploma Fee | 30.00 |

Board can be obtained at from $4.00 to $6.00 per week.

The instruments and tools required can be procured for from $35.00 to $45.00. This sum does not include the price of dental engine.

For further information, address

C. N. PEIRCE, D.D.S., Dean, 1415 Walnut St., Philadelphia.

ESTABLISHED 1845.

# Ohio College of Dental Surgery.

## DEPARTMENT OF DENTISTRY—UNIVERSITY OF CINCINNATI.

## SESSION 1895-96.

### FACULTY.

J. S. CASSIDY, A.M., M.D., D.D.S., Professor of Chemistry and Materia Medica.
H. A. SMITH, A.M., D.D.S., DEAN OF THE FACULTY, Professor of Operative Dentistry and Dental Pathology.
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